52301




# *BULLETIN OF THE DEPARTMENT OF ANTHROPOLOGY*

**Volume IX, Number 1**

FOR FAVOUR OF EXCHANGE

From :
Director
Anthropological Survey of India
Indian Museum
27 Chowringhee Road
CALCUTTA 13
I N D I A

# BULLETIN OF THE DEPARTMENT OF ANTHROPOLOGY


DEPARTMENT OF ANTHROPOLOGY
GOVERNMENT OF INDIA
CALCUTTA - 13

Published by

NIRMAL KUMAR BOSE
DIRECTOR, DEPARTMENT OF ANTHROPOLOGY
INDIAN MUSEUM
27, CHOWRINGHEE ROAD
CALCUTTA - 13

Printed by

PRABODH CHANDRA MITRA, M.A.
VENUS PRINTING WORKS
52/7, BIPIN BEHARI GANGULI STREET
CALCUTTA - 12





**Price: Rupees Nine and Fifty naye Paise only**

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# FOREWORD

The Department of Anthropology has pleasure in placing the present bulletin before the public. It contains several papers, one of which on 'The Human Skeletal Remains from Brahmagiri' is under the authorship of Dr S. S. Sarkar of the University of Calcutta. Dr Sarkar's report contains some interesting observations on the affinities of the megalithic people of India, and it is anticipated that this will give rise to some lively discussion.

The other papers on the Onge skeletons, dermatoglyphics of the Santal, anthropometry of the Madiga of Andhra Pradesh, Mahar of Maharashtra and note on the Nokte tribe, N.E.F.A. are by several members of the Department of Anthropology.

NIRMAL KUMAR BOSE
DIRECTOR

DEPARTMENT OF ANTHROPOLOGY

# HUMAN SKELETAL REMAINS FROM BRAHMAGIRI

S. S. SARKAR

## INTRODUCTION

The skeletal materials recovered from the archaeological excavations at Brahmagiri (Wheeler 1947) were sent to the present writer by Mr Nirmal Kumar Bose, Director, Department of Anthropology, Government of India, during July-September, 1959. They were excavated during March, 1947 and sent to the Department soon after.

## CONDITION OF SKELETAL MATERIALS

The skeletal materials were received by the author in four instalments. The first, comprising a skull (Br. Meg. 7. No. 2), was received on 25 July, 1959. The second lot of 30 cardboard boxes was received on 13 August, 1959, the third of 3 boxes on 26 September, 1959, and the last of 7 boxes on 28 September, 1959.

The skeletal materials were almost in the same condition in which they had been transported from the field, excepting four skulls (A, B, C and F) of Br. Meg. 1. Crania A, B and C had been restored at the Department of Anthropology, Indian Museum, Calcutta, when foreign materials were freely used to restore the missing parts. Cranium F was received in fragments (67 large and 36 very small), all cleaned, treated and gathered together in a cardboard box. They were said to be in the preparatory stage for restoration. A fragment of the left zygoma of skull A was received separately; it has been restored to the skull after removal of the foreign substance. Due to lack of care for twelve years, the bones have been further brittle in a large number of cases, particularly those which had been removed with a paraffin coating. Plasticine has also dried up to such an extent that it is difficult to remove, and so is the mixture of paraffin and plasticine. Obviously, skeletal material removed from the field should be given immediate attention in the laboratory. In the present case, some of the long bones like femur, tibia, etc. could have been of better anthropometric purpose if they had been attended to earlier. Some of the long bones could be restored to their full size, but there have been too many joinings to interfere with the original. It appears also that no measurements of any bone was taken in the field.

## HUMAN SKELETONS FROM MEGALITHS

A complete list of the skeletal remains from megaliths, sent to us, is given below.

LIST NO. 1

BRAHMAGIRI SKELETAL REMAINS

MEGALITHS

**Br. Meg. I.**

*Skull* — 6, numbered A, B, C, D, E and F (all adults excepting D); A, B and C restored at the Indian Museum, Department of Anthropology: F received in fragments cleaned and shellaced; D and E received in the condition as removed from the field.

Fragment of a left maxilla showing 2 teeth, II premolar and I molar; highly worn out (adult).

*Mandible* — (a) Left half of an adult—III molar existing, others broken.

(b) Mandible of a child—both condyles missing, permanent I molar erupted, right II deciduous molar present but much worn out, II permanent molars nearly appearing, about 12 (?) years old.

*Tooth* — (a) Root of a premolar (?), found attached to skull C.

(b) Crown of an upper premolar (?)—highly worn out, roots partly missing, appears to show some similarity in cusp pattern with that of skull B.

S. S. Sarkar is Lecturer, Department of Anthropology, Calcutta University.

(c) Unerupted right III permanent molar without root, extracted from the maxilla of skull D.

*Scapula* — Fragments—5 (adult).
*Vertebra* — Fragments—2 (adult).
*Rib* — Fragments—8 (adult).
*Humerus* — (a) Left, head missing and shaft flattened - appears to belong to a very robust individual (adult).
(b) Fragment—1, from middle of the shaft (adult).
(c) Lower end of left—(adult) individual not so robust as that of (a).
*Ulna* — (a) Upper end of right side (adult).
(b) Shaft fragment of left—individual not so robust as that of (a), (adult).
(c) Shaft fragments—2 (adult).
(d) Upper end—1 (child).
*Radius* — Shaft fragment—1 (adult).
*Carpal* — 3 (adult).
*Metacarpal* — 3 (adult).
*Phalange* — 2 (adult).
*Pelvis* — Fragment—1 (adult).
*Femur* — (a) Left, nearly complete, parts of greater trochanter missing, lower end somewhat compressed (adult).
(b) Right, head and greater trochanter missing, lower end along with the condyles pressed flat (adult).
(a) and (b) may be of the same person.
(c) Right, lower end very much distorted (adult).
(d) Left, distal end (adult).
(c) and (d) may belong to one individual.
(e) Left, upper end—appears to belong to a person more slender than the above (adult).
(f) Right, lower end (adult).
(g) Left, lower end (adult).
(h) Left, lower end (adult).
(i) Left, fragment of head (adult).
(j) Distal epiphysis (child).
*Patella* — (a) Right, appears to belong to an individual robuster than (b) (adult).
(b) Right (adult).
*Tibia* — (a) Right (adult).
(b) Right (adult).
(c) Left (adult).
(d) Left (adult).
(e) Lower end, belonging to a slender-built (adult).
(f) Fragment of lower end (adult).
(g) Middle of the shaft (child).
(b) and (d) appear to be of the same robustness and stouter than the others.
*Tarsal* — 4 (adult).
*Phalange* — 2 (adult).

**Br. Meg. IV.**

*Vertebra* — Fragments—2 (adult).
*Rib* — Fragments—2 (adult).
*Humerus* — Shaft fragment—1 (adult).
*Radius* — Shaft fragment—1 (adult).
*Femur* — Shaft fragment—1 (adult).
*Tibia* — Shaft fragment—1 (adult).
*Fibula* — Shaft fragment—1 (adult).
*Unidentified fragment* — 1 lot.

**Br. Meg. IV (a) & (b).**

*Scapula** — Fragment 1 (adult).
*Humerus** — Fragment 1 (adult).
*Radius* — Shaft fragments—3 (adult), two appear to belong to the same individual, while the third fragment belongs to an individual robuster than the former.
*Femur* Shaft fragments—2 (adult), belonging to two individuals, one robuster than the other.
*Tibia* Shaft fragment—1, appears to belong to a slender-built person.

**Br. Meg. IV (b).**

*Skull* — Fragments (adult)—1 lot.
*Tooth* — I upper premolar, roots partly broken.

**Br. Meg. IV (c).**

*Skull* — Distorted skull of a young adult; condition, as found in the field.

**Br. Meg. V.**

*Skull* — Represented by a small fragment (adult).
*Mandible* — Symphyseal fragment with teeth—1 (child ?).

* These bones are marked U.S., probably meaning 'upper skeleton'.

| | | |
|---|---|---|
| *Humerus* | — | Shaft fragments—3 (adult), of which two may be ascribed to one individual while the third fragment appears to be that of a less robust person. |
| *Ulna* | — | Fragment—1 (adult). |
| *Pelvis* | — | Fragment—1 (adult). |
| *Tibia* | — | Shaft fragment—1 (adult). |
| *Fibula* | — | Shaft fragment—1 (adult). |
| *Unidentified fragment* | — | 1 lot, with a fragment of a long bone of a child. |

**Br. Meg. V (a) & (b).**

| | | |
|---|---|---|
| *Skull* | — | Represented by small bits of child bones. |
| *Mandible* | — | Fragment of right, III molar *in situ,* crown of others broken (adult). |
| *Tooth* | — | Two fragments of molar crown — (adult). |
| *Unidentified fragment* | — | 1 lot. |

**Br. Meg. VII (1)** (Pit Circle)

| | | |
|---|---|---|
| *Skull* | — | 1, as found in the field (adult). |

**Br. Meg. VII (2)**

| | | |
|---|---|---|
| *Skull* | — | 1, as found in the field (adult). |
| *Tooth* | — | Complete—7; fragments—7. |
| *Humerus* | — | Shaft fragments—4 (adult). |
| *Radius* | — | Shaft fragment—1 (adult). |
| *Ulna* | — | Shaft fragment—1 (adult). |
| *Unidentified fragment* | — | 1 lot. |

**Br. Meg. VIII.**

| | | |
|---|---|---|
| *Scapula* | - | Fragment—1 (adult). |
| *Vertebra* | - | Fragments—2 (adult). |
| *Radius* | - | Shaft fragments—3, of which 2 fragments can be ascribed to one individual robuster than that of the third (adult). |
| *Ulna* | | Shaft fragments—2. |
| *Femur* | | Shaft fragments—2, one appears to belong to a robuster individual than the other (adult). |
| *Tibia* | | Shaft fragments—3, two can be ascribed to a slender individual while the third fragment appears to belong to a very robust person (adult). |
| *Unidentified fragment* | — | 1 lot. |
| *Bone pieces found on pot 10.* | — | Small shaft fragments of long bones—16. |
| *Bone pieces found on pot 11.* | — | Shaft fragments of long bones —6. |

**Br. Meg. VIII (a).**

| | | |
|---|---|---|
| *Skull* | — | 1, as found in the field (adult). |
| *Mandible* | — | 1, fragment of right side, larger in size than the (b) fragment (adult). |
| *Tooth* | — | 2, upper incisors, one broken. |

**Br. Meg. VIII (b).**

| | | |
|---|---|---|
| *Skull* | — | 1, as found in the field (adult). |
| *Mandible* | — | Right and left fragments—2, (no teeth) (adult). |

**Br. Meg. X.**

| | | |
|---|---|---|
| *Ulna* | — | Fragment—1, (adult). |

**Br. Meg. X (a) & (b).**

| | |
|---|---|
| *Tibia* | Fragment of upper end. This fragment is stouter than that under No. X (c) (adult). |

**Br. Meg. X (c).**

| | |
|---|---|
| *Radius* | Shaft fragments—2, of which one appears to be stouter than the other (adult). |
| *Ulna* | Shaft fragment—1 (adult). |
| *Tibia* | Shaft fragment 1 (adult). |
| *Unidentified fragment* | 3 (adult). |

It will be seen from the above list that no bones of Br. Meg. VI and Br. Meg. IX have been received by the present writer, although Wheeler mentions them on pages 192 and 199 of his report. This matter was duly reported to Mr Bose.

There are also a few other incongruities between Wheeler's report on the skeletal materials and those sent to us. Br. Meg. IV, according to Wheeler, yielded two broken skulls—one of which is of a dolichoid young adult, and two other skulls found at a different level; but to us the crania are represented by some fragments of adult, marked Br. Meg. IV (b), and the distorted skull of a child (?), numbered Br. Meg. IV (c). There are however evidences of three skeletons with us.

In the case of Br. Meg. V, Wheeler reports of 'a collection of disarticulated human bones includ-

ing two skulls'. To us, the cranial material is represented by a small fragment of an adult skull and a fragment of a child's (?) mandible, numbered Br. Meg. V, and, small bits of a child's skull marked Br. Meg. V (a) & (b). There is also a fragment of an adult mandible with the same number. Two adult persons are however discernible from the fragments of the humerii. The child skull is also supported by the fragment of a long bone of a child, numbered Br. Meg. V. There are similarly no trace of the three skulls of Br. Meg. X as reported by Wheeler.

Wheeler reports about 19 skulls in all -17 from cist-circles and 2 from pit-circles whereas only 12 crania were received by us (excepting bits of child's crania of Br. Meg. V); 10 from cist-circles, and 2 from pit-circles.

Wheeler has divided megaliths into two types: (a) cist-circles, and (b) pit-circles.

The cist-circles comprise the following skeletons: Br. Meg. I, IV, V, VIII and X, while of the four pit-circles (II, III, VII and IX) discovered, only VII and IX have yielded skeletal remains. Of the latter two, only VII was received by us.

Wheeler is inclined to treat the pit-circles as macerating pits or 'inverted towers of silence' to which Banerjee (1956) has raised an objection. A perusal of the skeletal parts mentioned in the above list will however show that in none of the two megalithic structures a complete quota of bones per individual has been found. For instance, in Br. Meg. I, six crania have been found which necessitate the presence of the requisite number of other bones of six skeletons. If only the long bones of the two pairs of limbs are taken into account it is seen that only 26 bones have been found in comparison to the expected number of 72, i.e., only 36.1% are represented in this megalith. In this manner the frequency of the presence of bones in the different megaliths and other burials from the Stone Axe Culture has been worked out in Table 1.

It woll be apparent from the Table 1 that the Stone Axe Culture burials, excepting Br. 21, U.B. 2, are better represented by the different parts of the skeleton than the megaliths. In case of Br. 17 C4. U.B. 2, the expected number of 100% bones have been found, while in cases of B.1.B.10 and A4. U.B.1 from site Br. 17, three-fourths of the bones are represented. Compared with this the megaliths are poorly represented. The highest frequency of 41.7% is seen in the case of Br. Meg. VIII while Br. Meg. X is represented by the lowest percentage of 16.7%. On an average, megaliths are represented by 27.5% of the long bones of the limbs compared with 60.8% of the same in the case of the Stone Axe Culture burials.

This paucity of bones in all the megaliths probably points out to a primary process in the disposal of the dead. The dead bodies were probably exposed to birds and beasts before some of them were collected for internment in megaliths. The structure for this primary process should be different and recognisable from the megaliths. All the Brahmagiri cist-circle megaliths contain more than one skeleton. Remains of six persons have been found from Meg. I, three from each of the megaliths IV, V and X, and two from Meg. VIII. Each megalith appears to be a family vault. They are obvious cases of multiple burials, as pointed out by Gordon Childe (1948).

It is beyond the competency of the present writer to go into the identification of the pit-circles as macerating pits, as suggested by Wheeler, and objected by Banerjee. The paucity of the skeletal parts in the megaliths necessitates the presence of some such exposure or macerating pits. There is nothing to be wondered at in there being only nine pit-circles for about 300 megaliths. There may have been common macerating pits for a group of families. Since the period of use of a macerating pit is temporary, we can very well compare it with a modern cremation ground, where a few pyres serve well and the same pyre is used repeatedly. This repeated use of the same pit for maceration probably explains the presence of grave furniture in the primary fillings of pits. Banerjee has pointed out that the presence of two crania and a few long bones in the pit-circle Meg. VII 'runs counter to the idea of selection from the maceration pit', suggested by Wheeler, but that skulls were not selected will be apparent from Br. Meg. VI, which according to Wheeler, did not yield any skull but only 8 or 9 human bones. It appears that there could hardly be any choice or selection if once the body was exposed. The pit-circles were probably always kept open and Banerjee's apprehension of 33 gold beads not being stolen is not inexplicable. Besides the nearly universal fear of the dead, which prevents common people visiting a grave-yard, the beads might have gone under the body or deep into the earth so as not to attract the robber's eye. There is one more fact. This pit-circle (Br. Meg. IX) alone has offered the presence of gold, which to some extent indicate the wealthy position of the individual

TABLE 1

**Frequency of Limb Bones found in Megaliths and other Burials**

| No. of skeletons as per | MEGALITHS I | IV | V | VIII | X | VII | Open 17B1B10 | U 17A4U1 | N 17C4UB2 | S 17A4UB1 | 21UB2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Wheeler. | 6 | 4 | 2 | 2 | 3 | 2 | 1 | 2 | 1 | 1 | 1 |
| Humerus | 3 | 2 | 3 | — | — | 4 | 2 | 2 | | | |
| Ulna | 5 | — | 1 | 2 | 2 | 1 | 1 | 1 | | | |
| Radius | 1 | 4 | — | 3 | 2 | 1 | — | 2 | | | |
| Femur | 10 | 3 | — | 2 | — | — | 2 | 2 | | | |
| Tibia | 7 | 2 | 1 | 3 | 2 | — | 2 | 2 | | | |
| Fibula | — | 1 | 1 | — | — | — | 2 | 2 | | | |
| Total | 26 | 12 | 6 | 10 | 6 | 6 | 9 | 11 | 12 | 9 | 1 |
| Expected No. | 72 | 48 | 24 | 24 | 36 | 24 | 12 | 24 | | 12 | 12 |
| % | 36.1 | 25.0 | 25.0 | 41.7 | 16.7 | 25.0 | 75.0 | 45.8 | 100.0 | 75.0 | 8.3 |
| | | 27.5% | | | | | | | 60.8% | | |

and that the death of such a person would not be known to the then society is rather difficult to imagine. The motive of stealing was probably absent.

Further, detailed examination of the crania and other long bones found in Br. Meg. VII shows some interesting phenomena, which though difficult to interpret correctly, almost support the hypothesis that the pit-circles were macerating or exposure pits. Firstly, the mass, which appeared to be one skull (Br. Meg. VII, skull 1), really comprises fragments of two crania, adhering together; one adult (Pl. IX. Fig 2) showing very thick, spongy, light bones and the other of a child or young adult (Pl. IX. Fig. 1), in which the petrous portions of the temporals have not yet ossified. It is difficult to state without a thorough chemical analysis of the above bones, but it appears that the adult fragments have lost comparatively more of their bony constituents than those of the child or young adult. This is indicative of the relative time of exposure of the two skeletons.

Secondly, the skull Br. Meg. VII, No. 2 is also a fragment of the right half of an adult skull. The other long bones, as given in List No. 1 (p. 7) may be associated with this crania but it was difficult to find evidence of long bones of the two crania mentioned above.

Thirdly, some fragments of animal bones have been found in association with the skull fragment, Br. Meg. VII, No. 2.

These facts probably show that this pit-circle was used at least thrice for exposing the above three skeletons and in each some remains of the cranium have been left over. Then how are we to explain the presence of the animal bones? Such bones have rarely been found in the cist-circles (a tiny fragment may be present in Br. Meg. I) and it may be a distinguishing criterion between the cist-circles and the pit-circles. Only further exploration of the pit-circles may elucidate the problem.

## HUMAN REMAINS FROM STONE AXE CULTURE

The Stone Axe Culture was revealed from two sites Br. 17 and Br. 21. The former yielded one open burial (B.1.B.10) of a child about 12 years old (Fig. A) and urn burials of three infants (A4. U.B. 1; C4. U.B. 2 and A4. U.B. 4). A4. U.B. 4 showed remains of two infants*, one of which was slightly more grown up than the other. This was apparent from the thickness of the cranial bones, which were found in bits, and the fragments of the ribs. The circumference of the ribs at the sternal end was 17 mm. in the case of the slightly grown up infant in comparison to 11 mm. of the other.

Site Br. 21 yielded only one urn of an infant (U.B.2). An adult unnumbered tooth, an upper third molar, was found from the box containing the remains of Br. 21, U.B.2. This will be apparent from the detailed identification List No. 2. This may be a later mix-up. Wheeler however reports on p. 196 of an isolated tooth found from Meg. IX.

A few fragments of animal bones were also found in association with Br. 17. B1.B.10., Br. 17. A4. U.B.1 and Br. 17 C4. U.B.2. These three lots were sent back to the Department of Anthropology.

It is probable that in the case of the open burial (B. 17. B.1.B.10) and in the case of the urn burials

* This may also be due to later mix-up.

in the majority of cases, the disposal of the dead involved only one primary process. It will be apparent from table 1 that excepting for Br. 17. A4. U.B. 4, and Br. 21. U.B. 2, all the skeletal parts are fairly well represented.

LIST No. 2

SKELETAL REMAINS FROM STONE AXE CULTURE

**Open Burial**

**Br. 17 B 1 B 10** (child, aged about 12(?) years)

| | | |
|---|---|---|
| *Skull* | | Almost complete except base. |
| *Tooth* | | Milk canine—1 |
| | | Milk incisor—1 |
| | | Permanent lower lateral incisor and canine, on a fragment of mandible. |
| *Scapula* | | Fragment—1 |
| *Vertebra* | | Fragments (a few complete) —1 lot. |
| *Rib* | | Fragments—1 lot. |
| *Humerus* | | Complete—2 |
| *Ulna* | | Complete—1 |
| *Pelvis* | | Ilium—2 |
| | | Ischium—1 |
| | | Pubis—1 |
| *Femur* | — | Complete—2 |
| *Patella* | — | 2 |
| *Tibia* | — | Complete—2 |
| *Fibula* | — | Complete—2 |
| *Carpal* | — | 6 (including 2 pisiforms) |
| *Metacarpal* | — | 7 |
| *Tarsal* | — | 9 |
| *Metatarsal* | — | 11 |
| *Phalanges of hand and foot* | — | 28 |
| *Epiphysis of long bone* | — | 1 lot. |
| *Unidentified fragment* | — | 1 lot. |
| *Animal bone* | — | 1 lot. |

**Urn Burial**

**Br. 17 C 4 U.B. 2** (child, about 3 years)

| | | |
|---|---|---|
| *Skull* | — | Represented by a fragment of basioccipital, other fragments —1 lot. |
| *Clavicle* | | Complete—2 |
| *Scapula* | | Complete—2 |
| *Vertebra* | | Complete—27 |
| | | Body—8 |
| | | Fragments—4 |
| *Rib* | | Complete—20 |
| | | Fragments—5 |
| *Humerus* | | Complete—2 |
| *Radius* | | Complete—2 |
| *Ulna* | | Complete—2 |
| *Pelvis* | | Ilium—Complete—2 |
| | | Ischium—Complete—2 |
| | | Pubis—Complete—2 |
| *Femur* | — | 2, one broken. |
| *Tibia* | — | 2, one broken. |
| *Fibula* | — | Complete—2 |
| *Tarsal* | — | 9 |
| *Metacarpal and Metatarsal* | — | 33 |
| *Epiphysis* | — | 13 |
| *Animal bone* | — | A few fragments. |

**Br. 17 A 4 U.B. 1** (infant)

| | | |
|---|---|---|
| *Skull* | — | Fragments—1 lot. |
| *Mandible* | — | 3 fragments with teeth *in situ*. |
| *Tooth* | — | Milk—12 |
| *Scapula* | — | Fragments—2 |
| *Vertebra* | — | Fragments—1 lot. |
| *Rib* | — | Fragments—1 lot. |
| *Humerus* | — | Fragments—2 |
| *Ulna* | — | Fragments—2 |
| *Radius* | — | Fragments—2 |
| *Pelvis* | — | Fragments—5 |
| *Femur* | — | Fragments—2 |
| *Tibia* | — | Fragment—1 |
| *Phalange* | — | 16 |
| *Unidentified fragment* | — | 1 lot. |
| *Animal bone* | — | 1 lot. |

**Br. 17 A 4 U.B. 4** (infant)

| | | |
|---|---|---|
| *Skull* | — | Fragmentary—belonging to two individuals as judged from the thickness of the cranial bones. |
| *Mandible* | | Fragment—1 |
| *Scapula* | | Fragments—2 |
| *Clavicle* | | Complete—2 |
| *Vertebra* | | Fragments—1 lot. |
| *Rib* | | Fragments—1 lot. |
| | | Fragments 4, of another individual somewhat older. |
| *Humerus* | | Complete—2 |
| *Radius* | | Fragments—2 |
| *Ulna* | | 1, broken. |
| *Pelvis* | | Fragments—6 |
| *Femur* | | Complete—2 |
| *Tibia* | | 2, one broken. |
| *Fibula* | | Complete—2 |

| | | |
|---|---|---|
| *Metatarsal and Phalange* | — | 19 |
| *Ephphysis* | — | 10 |
| *Unidentified fragment* | — | 1 lot. |

**Br. 21. U.B. 2** (infant)

| | | |
|---|---|---|
| *Skull* | — | Fragment—1 |
| *Vertebra* | — | Body—1 |
| *Humerus* | — | Left—1 |
| *Tooth* | — | One adult tooth, unnumbered, found in the same box containing the above bones. |

Besides the above skeletal remains from Stone Axe Culture sent to us, Wheeler on page 229 of his report gives details of 10 other urn burials all of which yielded bone remains of infants. His data are given below:

| | |
|---|---|
| *Burial urn Br. 17 No. 1* | — Broken skull, some ribs and a few long-bones of a small child. |
| *Burial urn Br. 17 No. 2* | — Infant's skeleton. |
| *Burial urn Br. 17 No. 3* | — Only a few small human bones were left at the bottom. |
| *Burial urn Br. 17 No. 7* | — A few small decayed bones. |
| *Burial urn Br. 17 No. 9* | — Only a few small human bones. |
| *Burial urn Br. 21 No. 1* | — Some much decayed infant bones. |
| *Burial urn Br. 21 A No. 1* | — Fragments of a child's skull, a few ribs and some long bones. |
| *Burial urn Br. 21 A No. 2* | — Skeletal remains much decayed comprising a child's skull and a few long bones. |
| *Burial urn Br. 16 B No. 3* | A few infant bones. |
| *Burial urn Br. 16 B No. 4* | Bones of an infant. |

The megalithic burials and those from the Stone Axe Culture thus show altogether different methods of disposal of the dead. Megaliths appear to be secondary burials preceded by the primary process of exposure. This appears to apply in the case of both adults and children: the latter being represented by skull D from Br. Meg. I and also that of Br. Meg. IV (c) probably. Small infants were also similarly treated as evidenced by the small bits of cranial bones from Br. Meg. V (a) & (b).

In the case of Stone Axe Culture small babies probably below 3 years of age have been found in urns. Wheeler mentions the 'infant being folded up into close compass and packed into the pot'. The serial numbers of the urn burials in Wheeler's list given above show 10 additional urn burials, thus giving a total of 14 urn burials from this culture. The open burial No. Br. 17. B.1.B.10 shows that grown up children of about 12 years of age were simply buried with grave furniture. It is not known what was the custom for adults.

## DESCRIPTION OF CRANIA AND OTHER BONES MEGALITHS

**Br. Meg. I. Skull A** (Pl. I, Figs. 1-6)

Restored at the Department of Anthropology, Indian Museum; condition in which found in the field unknown, skull was probably badly crushed, complete excepting a large portion of the occipital, sphenoid, basioccipital and the anterior portion of the foramen magnum, right half of the skull shows very small unconnected pieces fixed on a wax base.

Adult, appears to be male. Mesocranial (78.21), Chamaecranial (57.82), Tapeinocranial (73.93), Platyrrhine (52.94).

*Norma Verticalis* (Pl. I, Fig. 2)

Long oval in shape, broadest at the parietal tuberosities, coronal suture present from bregma to stephanion on both sides, sagittal suture open about half the region from bregma, lambdoial suture present on both sides from lambda for a short distance, right parietal foramen present.

*Norma Lateralis* (Right) (Pl. I, Fig. 3)

Medium vault, forehead straight, supraorbital ridges medium, nose concave, alveolar prognathism present, occipital region nearly rounded in appearence, mastoid well developed, broken at the tip, supra-mastoidal crest fairly marked, zygomatic process missing, pre-auricular and post-auricular portions nearly equal.

Left side does not show anything peculiar from the above.

*Norma Occipitalis* (Pl. I, Fig. 4)

Much of the occipital bone missing, muscle impressions cannot be judged due to the very small fragments joined together on a wax base, two large mastoidal foramina on right and one on left.

*Norma Facialis* (Pl. I, Fig. 5)

Forehead vertical, medium breadth and height, glabella prominent, face broad, malar prominent and well developed, nose platyrrhine (52.94), medium broad at the base, orbits quadrilateral (?) in shape.

*Norma Basalis* (Pl. I, Fig. 6)

Palate more horse-shoe-shaped than 'U', very shallow as appears from the restoration.

No teeth present, except right III molar, worn out and partly broken, a number of other teeth also broken, only roots present in sockets. Both right and left I and II molars appear to have fallen long ago, since the alveolar margins are fused, nothing could be discerned due to restoration, glenoid fossae remarkable for its width and shallowness.

**Br. Meg. I, Skull B** (Pl. II, Figs. 1-7)

Restored at the Department of Anthropology; a large fragment of frontal, two fragments from either side of occipital and a few fragments of the temporal bones missing, facial portion nearly complete excepting for the sphenoids and the inner bones behind the nose. Found badly compressed at the occipital region, pushing the parietals above the former.

Adult male, very well developed as judged from the muscular impressions. Brachycranial (83.52), Orthocranial (61.26), Tapeinocranial (79.64), Hyperplatyrrhine (62.50).

*Norma Verticalis* (Pl. II, Fig. 3)

Nearly round in shape, broad, flat at the top, broadest at the parietal tuberosities, not so sharply seen as in skull A, coronal and sagittal sutures open, occipital side abruptly slopes down, supraorbital ridges present only at the left side, also visible from the vertical aspect, no parietal foramina.

*Norma Lateralis* (left) (Pl. II, Fig. 4)

High vaulted, supratemporal line very much marked, and runs continuously from the fronto-temporal ridge to the occipital side, where it shows a definite eminence before merging on to the supra-mastoidal crest, latter very much prominent, mastoid well developed, frontal bone sloping, shows a deep furrow at the forehead, supraorbital ridges prominent, nasal depression very deep, alveolar prognathism well marked, occipital side slopes down abruptly, shows a prominent external occipital protuberence, occipital bone shows a flat depression above the lambda, pre-auricular development distinctly greater than the post-auricular, right side almost similar to that of the left.

*Norma Occipitalis* (Pl. II, Fig. 5)

Somewhat pentagonal in outline with a flattened occiput, mastoids prominent, superior nuchal crest marked, lambdoidal suture open.

*Norma Facialis* (Pl. II, Fig. 6)

Face very broad, forehead broad, sloping backwards, orbits quadrilateral, nose concave, sunken, depressed at the root, supraorbital ridges prominent, slightly overhanging in appearence, nose very broad (52.50); lower border of pyriform aperture-oxycraspedote, malars very broad and prominent.

*Norma Basalis* (Pl. II, Fig. 7)

Palate very deep, U shaped, teeth as a whole large in size, all present excepting two canines and left I premolar, no trace of III molar on either side, teeth highly worn out, molars and premolars show a marked slope towards the lingual side, specially marked on I right molar; occipital region shows prominent external occipital protuberence, superior nuchal arch, as also the inferior nuchal ones; left mastoid very prominent, left digastric groove broad and wide, glenoid fossae very wide and shallow; occipital condyles missing; cranial bone appears to be thicker than that of skull A.

**Br. Meg. I, Skull C** (Pl. III, Figs. 1-7)

Restored at the Department of Anthropology, found in a badly distorted condition, vault badly crushed and compressed below distorting the whole facial configuration, frontal bone (Fig. 4), shows an irregular large hole about 57 mm. long and 43 mm. broad, it being filled up by some foreign substance during restoration and a few disjoined fragmentary pieces being fixed near about. Their removal was not attempted, and the true nature of the hole could not be assessed; photograph however shows a different structure of the hole after restoration.

Adult male, Mesocranial (79.13), Hypsicranial (63.68), Metriocranial (80.23), Hyperplatyrrhine (61.05).

*Norma Verticalis* (Pl. III, Fig. 3)

Long oval in shape, greatest width at the parietal tuberosities, occiput showed a rounded bulge, forehead nearly vertical, supraorbital ridges slightly perceptible, coronal suture open, some portions of frontal bone missing, sagittal suture open, no parietal foramen.

*Norma Lateralis* (Left) (Pl. III, Fig. 4)

Medium vaulted, occipital side rounded, forehead nearly vertical, supraorbital ridges traceable, temporal ridge well marked, continued throughout the whole of parietal surface; malars prominent, mastoids medium, supramastoidal crest medium, large fragment of temporal bone missing, particularly at the sphenoidal region, right side almost the same excepting mastoid, broken at the tip, alveolar prognathism apparent, pre-auricular and post-auricular regions nearly equal.

*Norma Occipitalis* (Pl. III, Fig. 5)

Circular in outline with a rounded bulge very much similar to that of A, right occipital broken, lamboidal suture open, mastoids moderately developed, digastric groove of medium depth.

*Norma Facialis* (Pl. III, Fig. 6)

Forehead nearly vertical with a furrow above the supraorbital ridges, latter being present in traces, orbits quadrilateral (?), (left orbital wall restored), nasal bone missing, molar prominent, alveolar margin broken, shows prognathism.

*Norma Basalis* (Pl. III, Fig. 7)

Palate U shaped, no teeth excepting a fragment of left III molar, which appears to be broken, alveolar margin shows fusion, glenoid fossa unlike skull A and B, appears to be deep, muscular impression on lower border of occipital bone shows a very rough and rugged surface.

**Br. Meg. I, Skull D** (Pl. IV, Figs. 1-2)

Badly crushed, a large fragment of left parietal missing, skull probably distorted due to some pressure falling at the vertex resulting in the form of a rhombus, basal portion intact, appeared to be of a child, 12 (?) years old. A permanent III molar was found sticking on the alveolar border at the extreme right end of the maxilla.

The restoration of the skull was possible in two parts, the intact base with a portion of frontal bone and the rest of the calotte with a large portion of right parietal, and almost the whole of left parietal.

Cranial bone, as is expected of a child, is thin in comparison to the other skulls described before.

No measurements are possible.

A child's mandible (Pl. IV, Figs. 3-5) was also found in the megalith and the above skull may be ascribed to it.

The following measurements were taken before restoration of the skull.

| | | |
|---|---|---|
| Max. length | — | 181.5 mm |
| Glabella—opisthion length | — | 174.5 mm |
| Max. breadth (at the parietal boss) | — | 125 mm |
| Auricular height | — | 96.5 mm |
| Least frontal breadth | — | 88.5 mm |
| Bizygomatic breadth | — | 84 mm |
| Bimastoid breadth | — | 80 mm |
| Palatal breadth (between I and II molars) | — | 33 mm |
| Nasion—inion length | — | 165 mm |
| Length breadth index | — | 68.87 |
| Length height index | | 53.16 |
| Jugofrontal index | — | 110.62 |

This skull, after restoration of the frontal bone and with its base and the facial region in tact, was sent to the Department of Anthropology, Indian Museum, for an X-ray photography of the dentition. During the above photography it was accidently broken into pieces making further restoration impossible. The measurements given above were taken before the above unfortunate incident.

*Norma Verticalis*

Nothing could be judged excepting that the skull is long with a low forehead and bulging occiput, no suture excepting the left lambdoidal suture, which is open, could be seen.

*Norma Lateralis*

Longish in contour, low vaulted, temporal line weakly present, occipital region rounded, forehead nearly sloping backwards, with a slight furrow above the glabella, which is prominent; mastoids weakly developed but supramastoidal crest discernible.

*Norma Occipitalis*

Occipital bone fairly complete, shows rounded bulge, mastoids show a rugous muscular impression, two mastoidal foramina on the right, muscular impressions fairly well marked.

*Norma Facialis*

Facial region compressed sideways and due to secondary breakage during X-ray photography it

has lost many other parts. Glabella prominent with a furrow above it, lower border of the pyriform aperture—amblycraspedote, maxillary region appears to be rather strongly build for a child.

*Norma Basalis*

On the basal side the palate is in fairly good condition, except that it has undergone some lateral compression, I permanent molar and two deciduous molars present on each side, II molar visible on either side at the alveolar margin, palate deep, horse-shoe to U shaped in outline, glenoid fossae shallow.

**Br. Meg. I, Skull E** (Pl. V, Figs. 1-5)

Sent in the same condition as found in the field, crushed at the right temporal, causing a deep depression at this region, parietals thereby pushed upwards in the form of inverted V at the region of bregma, and the occipital bone pushed outwards. Skull undergone a severe lateral compression, basal region fairly intact, measured 204 (?) mm. in length, which, prior to restoration was 194 mm., correspondingly breadth was 108 mm. before restoration measured 131 (?) mm. afterwards.

Adult female (?), Hyperdolichocranial (64.22?), Chamaecranial (54.90?), Metriocranial (85.49?), Leptorrhine (36.96?).

*Norma Verticalis* (Pl. V, Fig. 1)

Long oval, parietal tuberosities rounded, forehead retreating, occipital region shows circular bulge, sagittal suture open.

*Norma Lateralis* (Left) (Pl. V, Fig. 2)

High vaulted, forehead retreating, occiput bulged and circular, mastoid prominent, supramastoidal crest medium, temporal ridge traceable up to a slight distance, pre-auricular and post-auricular regions nearly equal.

Right side missing in major parts.

*Norma Occipitalis* (Pl. V, Fig. 3)

Occipital outline more or less pentagonal, occipital bulge prominent, other parts missing.

*Norma Facialis* (Pl. V, Fig. 4)

Facial region compressed laterally distorting the forehead, orbits and other parts of the face, orbits quadrilateral in shape, supraorbital ridges present in traces as also the furrow above it, lower border of the pyriform aperture—amblycraspedote.

*Norma Basalis* (Pl. V, Fig. 5)

Base intact, laterally compressed, causing part of the right side overlapping the left at the foramen magnum and the reverse of it at the region of the palate; only right I molar, of which a fragment is missing, and II premolar present, glenoid fossae shallow and smaller in size than the others described above.

**Br. Meg. I. Skull F** (Pl. VI, Figs. 1-4)

Skull received in 67 large and 36 very small fragments, probably at a stage preparatory to restoration; field condition unknown. After restoration two large fragments of parietals could be joined together with nearly half of the frontal bone and a small fragment of the occipital bone below the lambdoidal suture; a fragment of right maxilla with a few teeth was also found. A limited number of measurements could be taken as given in table 2.

Adult male, Brachycranial (80.75 ?), appears to be of a very robust individual, cranial bones thicker than the others described above, Orthocranial (62.27), Tapeinocranial (77.15).

*Norma Verticalis* (Pl. VI, Fig. 2)

Broad oval in outline, flat at the top, retreating forehead, bulging occiput, all sutures open excepting a part of the coronal suture at the region of stephanion, parietal boss (left) well marked, maximum breadth at the parietal tuberosities.

*Norma Lateralis* (Left) (Pl. VI, Fig. 3)

High vaulted, flat and broad at the top, temporal line not so marked as in others, forehead sloping, occiput bulging, marked by a depression around the lambdoidal region, pre-auricular length greater than post-auricular, supramastoidal crest prominent.

Right side represented by the temporal and the mastoid process, similar to the left.

*Norma Facialis*

Represented by the left half of the frontal bone which shows supraorbital ridge in trace.

*Norma Occipitalis* (Pl. VI, Fig. 4)

Outline circular, with prominent mastoids, lambdoidal suture open, two mastoidal foramina situated closely on the left side nearly similar to those in skull A, in which they occur on right side.

*Norma Basalis*

Represented by the two temporals, very broad and deep glenoid fossae, mastoid processes prominent, digastric groove deep.

## TABLE 2

### Measurements of the Crania from Br. Meg I. (in mm.)

| Measurements | | I A | I B | I C | I E | I F | IV (c) | VIII (b) | Br. 17 B. B10 |
|---|---|---|---|---|---|---|---|---|---|
| | | MEGALITHIC | | | | | | | Open burial |
| Max. cranial length | ... | 179 | 182 ? | 184.5 | 204 ? | 187 ? | 175.5 | 183 | 179 |
| Max. cranial breadth | ... | 140 | 152 | 146 | 131 ? | 151 ? | — | 136 | 124 |
| Nasion inion length | ... | 195 | 168 | — | 193 ? | — | — | — | 171 |
| Basilo bregmatic height | ... | — | — | 138 | — | — | — | — | — |
| Auricular height | ... | 103.5 | 111.5 | 117.5 | 112 | 116.5 | — | — | 106.5 |
| Least frontal breadth | ... | 100 | 101.5 | 100 | 75 ? | — | — | — | — |
| Greatest frontal breadth | ... | 188 | 120 | — | — | — | — | — | — |
| Bimastoid breadth | ... | — | 111 | 98 | 60 ? | 110 | — | — | 93 |
| Bizygomatic breadth | ... | — | — | — | 89 ? | — | — | — | — |
| Nasion basion line | ... | | | 98 ? | 119 ? | | | | |
| Prosthion basion line | ... | | | 102 | 114 ? | | | | |
| Nasion prosthion line | ... | 67 | 64 | 57 | 51 ? | | | | |
| Nasal height | ... | 51 | 48 | 47.5 | 46 ? | | | | |
| Nasal breadth | ... | 27 | 30 | 29 | 17 ? | | | | |
| Inter orbital breadth | ... | — | — | — | 13 ? | | | | |
| Orbital breadth, right | ... | — | 46 | — | 34 ? | | | | |
| Orbital breadth, left | ... | — | 48 | — | 36.5 ? | | | | |
| Orbital height, right | ... | — | — | 35 | 31 ? | | | | |
| Orbital height, left | ... | 37.5 | 31 ? | 35 | 30 ? | | | | |
| Maxillo alveolar breadth | ... | — | 72 | — | — | | | | |
| Palatal breadth | ... | 47 | — | 41 | — | | | | |
| Occipital foramen, length | ... | — | — | 29.5 | 22 ? | — | — | — | — |
| Occipital foramen, breadth | ... | — | — | 30 | 12 ? | — | — | — | — |
| Sagittal cranial arc | ... | 375 | 373 | 385 | 400 ? | — | — | — | 295 |
| Transverse cranial arc | ... | 317 | 332 | 329 | — | — | — | — | — |
| Horizontal circumference | ... | 505 | 527 | 515 | — | — | — | — | — |
| Bi-auricular breadth | ... | 113 | 127 | 188 | 76 ? | — | — | — | 99 |
| Outer bi-orbital breadth | ... | — | 115 | — | — | — | — | — | 91 |
| Inner bi-orbital breadth | ... | — | 109 | — | — | — | — | — | 83 |
| Greatest occipital breadth | ... | 96 | — | — | — | — | — | — | — |
| Frontal arc | ... | 120 | 133 | — | — | — | — | — | 116 |
| Parietal arc | ... | 125 | 128 | 126 | — | — | — | — | 130 |
| Occipital arc | ... | 130 | 113 | 126 | 129 | — | — | — | 96 |
| Frontal chord | ... | 107 | 114 | 112 | — | — | — | — | 104 |
| Parietal chord | ... | 114 | 111.5 | 115 | — | — | — | — | 112 |
| Occipital chord | ... | 105 | 93 | 103 | 96 ? | — | — | — | 85.5 |
| Bi-orbitonasal arc | ... | — | 116 | — | — | — | — | — | — |
| Glabella nasion length | ... | 6.5 | 12 ? | 11 ? | 7 ? | — | — | — | 10 |
| Nasion lambda line | ... | 173 | 174 | 173 | 187 ? | — | — | — | 175 |
| Calvarial height | ... | 107 | 111.5 | 107 | — | — | — | — | 96 |
| Lambda calvarial height | ... | 69 | 73.5 | 73.5 | — | — | — | — | 65 |
| Bregma position line | ... | 98 | 101 | 100 | — | — | — | — | 85 |
| Frontal perpendicular | ... | 28 | 27 | 28 | — | — | — | — | 24 |
| Parietal perpendicular | .. | 21.5 | 28.5 | 20 | — | — | — | — | 28 |
| Occipital perpendicular | ... | 30 | 27 | 30 | — | — | — | — | 16.5 |
| Frontal inclination angle | ... | 66° | 62° | 63.5° | — | — | — | — | — |
| Occipital inclination angle | ... | 87° | 83° | 84.5° | — | — | — | — | — |
| **Indices** | | | | | | | | | |
| Length-breadth index | ... | 78.21 | 83.52 | 79.13 | 64.22 ? | 80.75 | — | 74.32 | 69.27 |
| Length-auricular height index | ... | 57.82 | 61.26 | 63.69 | 54.90 ? | 62.30 | — | — | 59.50 |
| Breadth-auricular height index | ... | 73.93 | 73.36 | 80.48 | 85.50 ? | 77.15 | — | — | 85.89 |
| Length-basion-bregma height index | ... | — | — | 74.80 | — | — | — | — | — |
| Breadth-basion-bregma height index | ... | — | — | 94.52 | — | — | — | — | — |
| Superior facial index | ... | — | — | — | 57.30 ? | — | — | — | — |
| Jugofrontal index | ... | — | — | — | 84.27 ? | — | — | — | — |
| Orbital index: right | ... | — | — | — | 91.18 ? | — | — | — | — |
| Orbital index: left | ... | 64.58 | — | — | 82.19 ? | — | — | — | — |
| Nasal index | ... | 52.94 | 62.50 | 61.05 | — | — | | | |

**Mandibles** (Br. Meg. I) (Pl. IV, Figs. 3-8)

(a) Fragment of left half, adult, (Pl. IV, Figs. 6-8) with the III molar and the roots of I, II molar and the I premolar *in situ*, III molar highly worn out, individual possessed very strong chewing muscles, condyles and coronoid processes missing, gonial angle also shows strong muscle impression.

(b) Mandible of a child, (Pl. IV, Figs. 3-5), described on page 5 (List No. 1).

The following measurements of the mandibles could be taken :

TABLE 3

**Measurements of Mandibles (in mm.)**

| | Br. Meg. I (adult) | Br. Meg. I (child) | Br. Meg. V (adult) |
|---|---|---|---|
| Bigonial breadth | — | 75 | — |
| Minimum breadth of ramus | 34 | 26 | 34 |
| Symphyseal height | 30 (?) | 16 (?) | — |

**Maxillary Fragments**

Two fragments of upper jaw were found in Br. Meg. I; one in association with skull F and the other isolated.

(i) *Maxilla F* (Pl. IV, Fig. 11)

Adult, nearly half of left side, with two molars I and II in good condition, III molar and II premolar broken, molars not so highly worn out, cusps visible, specially II molar shows four such cusps, I molar somewhat more worn out than II.

(ii) *Isolated Maxilla* (Pl. IV, Figs. 9-10)

Adult, almost half of the left side present, showing I molar and II premolar *in situ*, roots of II molar and I premolar embedded in sockets, I molar more worn out than that of F and of larger dimension than the latter.

**OTHER SKELETAL PARTS**

*Humerus*, (Pl. VI, Fig. 5)

Three fragments of humerus found, appear to belong to three different individuals, fragment (a) appears to be of a very robust individual, (b) to a person less robust than (a), and (c) appears to be the slenderest of the three, as the following measurements will show :

| | (a) | (c) |
|---|---|---|
| Breadth of the distal end | 70 (?) mm. | 57 mm. |

(c) is much smaller than the fragment (a) and since the former appears to be of an adult person, it may be correlated to the female individual represented by skull E.

*Ulna* (Pl. VI, Fig. 6)

Two ulnar fragments (a) and (b) (List No. 1, Page 6) appears to belong to two individuals, one robuster than the other.

The existing fragment of child's ulna, (d), without the two epiphyses is 116 mm. long. Further, its slenderness is indicative of a child and may be identified to skull D.

The following measurements of the adult ulna (a), were possible :

| | |
|---|---|
| Max. breadth of olecranon cap | .. 22 mm. |
| Thickness of olecranon cap | .. 25 mm. |
| Height of olecranon cap | .. 4 mm. |

*Femur* (Pl. VII, Figs. 1-2)

Altogether 10 complete and incomplete femora were found in this megalith. As will be seen from List No. 1 (p. 6) that (a) and (b) may belong to the same individual and, (c) and (d) to a second one. Fragment of the distal epiphysis (j) belong to a child, while nothing can be said of the fragments (f) — (i).

TABLE 4

**Measurements of Femora from Br. Meg. I. (in mm.)**

| | (a) Lt. | (b) Rt. | (c) Rt. | (e) Lt. |
|---|---|---|---|---|
| Absolute length ... | 434 | — | 468 | — |
| Physiological length of shaft ... | 428 | — | -- | — |
| Prox. dorso-ventral-diam. of shaft ... | 27.5 | 24 ? | 32.5 | 23 ? |
| Prox. medio-lateral diam. of shaft ... | 34.5 | 36 ? | 31 | 30 ? |
| Prox. dorso-ventral-diam. of shaft ... | 30 | 30 | 37 | 28 ? |
| Med. medio-lateral diam. of shaft ... | 30 | 29 | 26 | 25? |
| Med. circumference of shaft ... | 94 | 93 | 104 | 85 |
| Vertical diam. of head ... | 41.5 ? | — | 43 | — |
| Transverse diam. of head ... | — | — | 42 | — |
| Circumference of head ... | — | — | 139 | — |
| Vertical diam. of neck ... | 31 ? | -- | 34 | 26 |
| Transverse diam. of neck ... | -- | — | 21 | 22 |
| Dorso-ventral diam. of distal end ... | 33 ? | 20 ? | | |
| Medio-lateral diam. of distal end ... | 45 ? | 52 ? | | |

Table 4 shows that (a) and (b) fairly agree in the measurements, excepting the proximal dorso-

ventral diameter, which shows a lower value of 24 (?) mm. in the case of (b) and is due to the broken nature of the head of the femur.

Of the other fragments, four and a head fragment (i), belong to the left side, while two to that of the right. Six individuals of this megalith may thus be accounted for,

| | |
|---|---|
| (a) & (b) | . . . 1 person |
| (c) — (h) | . . 4 persons |
| (j) (child) | . . 1 person |
| | 6 persons |

The upper end of the femur (c) appears to belong to a female in view of its slenderness.

*Tibia* (Pl. VII, Figs. 3-4)

There are 7 fragments, of which fragment (g) belongs to a child and others to adults. Fragment (f) is the slenderest of all the adults and may possibly belong to a female.

TABLE 5

**Measurements of Tibiae from Br. Meg. I. (in mm.)**

| | (a) Rt. | (b) Rt. | (c) Lt. | (d) Lt. | (e) ? | (f) ? |
|---|---|---|---|---|---|---|
| Prox. dorso-ventral diam. | 39 ? | — | — | — | — | — |
| Prox. medio lateral diam. | 11 | — | · | | — | — |
| Med. dorso-ventral diam. | 33 | 36 ? | 31 | 36.5 ? | 25 | 19 |
| Med. medio-lateral diam. | 25 | 26 ? | — | 25.5 | 22 | 15 |
| Dist. dorso-ventral diam | — | — | — | — | 23 | — |
| Dist. medio-lateral diam. | — | — | — | — | 20.5 | — |
| Circumference of shaft (med.) | 93 | — | — | - | 76 ? | 53 |
| Least circumference of shaft | 83 | - - | — | - - | 70 | — |

**Br. Meg. IV.** (Pl. VIII, Figs. 1-3)

This megalith yielded fragment of an adult skull No. IV(b) and of a child or young adult, No. IV(c).

Nothing could be made out of the fragments IV(b). A few of these fragments may belong to IV(c) but that there were two adult skulls is obvious from a fragment of the occipital bone of IV(b), which is almost intact in IV (c). The latter appears to belong to a child as judged from the thin cranial bones and its small size. The cranial bones are adhering to the lateritic endocranium which has retained its shape, at least the length to some extent. The description of the skull is given below.

*Norma Verticalis* (Pl. VIII, Fig. 1)

Long oval, tapering at the region of the forehead and a bulge at the occipital side, large fragment of the vault missing, sagittal suture not discernible.

*Norma Lateralis* (Right) (Pl. VIII, Fig. 2)

Large portions of parietal, temporal and frontal missing, forehead retreating, vault medium, occipital bulge circular and pronounced, temporal ridge present at the fronto-temporal region, only the length of the skull could be measured, which is 175.5 mm.

Left side—a few fragments are sticking on the lateritic mass.

*Norma Occipitalis* (Pl. VIII, Fig. 3)

Large portions of the occipital bone along the temporals and the mastoid missing, occipital bulge pronounced, lambdoidal suture open on both sides from the lambda for a certain length, no prominent muscular impressions on the nuchal region.

*Norma Facialis*

Entire facial portion missing, forehead vertical to some length above the prominent glabella, then it retreats backwards ; roof of the left orbit present, shows a sharp orbital margin, no trace of the supraorbital ridges.

*Norma Basalis*

Nothing present excepting a fragment of the right temporal showing small glenoid fossa.

The rest of the other bones are not of any anthropometric use. They however show two adult individuals, one of whom is robuster than the other, besides the young adult or child represented by the skull above.

**Br. Meg. V.** (Pl. VIII, Figs. 4-7)

*Crania* and *Mandible*

Represented by a small fragment of an adult crania (Pl. VIII, Fig. 4) and a lot of fragments of child cranium, which includes a fragment of the unossified petrous portion of the temporal bone.

There is also a fragment of mandibular symphysis without any teeth, but shows four small sockets of incisors. This fragment appears to be of a child.

A fragment of right half of an adult mandible (No. V(a) & (b) (Pl. VIII, Figs. 5-7) was also found with the III molar *in situ* and the broken roots of the I and II molars in sockets. It was badly crushed into several pieces, but could be restored with a portion of the horizontal ramus missing. It shows deep muscular impression particularly at the gonial angle which had caused a rugous area bent slightly outwards.

Only minimum breadth of the ramus could be measured, which is 34 mm. The III molar is highly worn out.

*Humerus* (Pl. VIII, Fig. 8)

The following measurements (in mm.) of the three shaft fragments are as follows.

| | (a) | (b) | (c) |
|---|---|---|---|
| Circumference of the shaft (at the upper third) ... | 67 | 67 | 62 |
| Least circumference of the shaft ... | | 67 | |

The measurements appear to show that humerii (a) and (b) belong to a person robuster than (c).

*Ulna*

The least circumference of the diaphysis of the ulna measures only 38 mm.

**Br. Meg. VII (1)** (Pit-circle) (Pl. IX, Figs. 1-2)

This cranial mass was found in a peculiar condition in which the anterior and the posterior portions of a skull could not at first be determined. A part of the sagittal suture with two fragments of the parietals on either side and a fragment of the occipital below were visible from the mass. As such the different fragments were carefully removed after a sketch, in which all fragments were serially numbered, had been prepared.

After removal of the bones it was seen that the mass contained fragments of two skulls stuck together by the lateritic soil. After restoration, it was seen that a large portion of the skull of a child or young adult (?), which has been numbered (a), (Pl. IX, Fig. 1) has been adhering to the parietal fragment of another adult skull numbered (b) (Pl. IX, Fig. 2). There are also some fragments of the frontal bone of skull (a) showing bits of orbits, two unossified pieces of the petrous portion of the temporals, and a fragment of left temporal bone showing a part of external auditory meatus. The part of the sagittal suture with fragments of the two parietals on either side and a fragment of the occipital below, mentioned above, belonged to the child.

The cranial bones of the adult were thick, spongy and lighter than the average. (cf. Page 9)

No measurements could be taken.

**Br. Meg. VII (2)** (Pit-circle) (Pl. IX, Fig. 3)

Only the right half of a skull besmeared with wax and plasticine was received. The internal surface was filled with earth and the occipital surface was crushed, thereby breaking the other bones all around into small pieces. Facial region not at all discernible. In the process of cleaning a large number of fragments of the skull cap was found. It also contained fragments of the base of the cranium showing the right glenoid fossa.

Seven complete and 7 other fragments of teeth were also found.

A few fragments of animal bones are suspected. They were sent back to the Department of Anthropology.

**OTHER SKELETAL PARTS**

Of the other long bones given in List No. 1 only the radius can be measured for the least circumference of diaphysis. This gives a measurement of 46 mm. The existing length of the radius is about 188 mm. and appears to be quite robust. This is also indicated by the fragment of the ulna.

**Br. Meg. VIII (a)**

This megalith yielded two crania No. (a) and (b). Both were received in the condition as found in the field. Skull (a) is a long oval, matrix of hard lateritic soil with a few fragments of cranial bones sticking on it. The fragments appeared to be of the left parietal and of the occipital bone. No remains of the vault or the right parietal present. No important anatomical feature could be recognized.

**Br. Meg. VIII (b)** (Pl. IX, Fig. 4)

This cranium is represented by a calotte, the facial, the basal, a large portion of the occipital, and the right parietal missing. Before taking out the inner earth skull measured :

Max. length — 183 mm.
„ breadth — 136 mm.

In the process of cleaning the following bones were found inside the calotte :

(a) portion of zygomatic bone
(b) root of a tooth, probably incisor, and
(c) a part of occipital.

It appears to be of a young adult or female (?).

*Norma Verticalis*

Long oval, maximum breadth at the parietal tuberosities, sutures not visible due to eroded parts of the skull, endocranial sutures, coronal and sagittal open, forehead sloping, occipital bone missing.

*Norma Lateralis*

Vault cannot be determined, also undergone some amount of flattening, temporal bone missing as also the occipital, temporal ridge marked at the fronto-temporal, forehead low and sloping, supraorbital

ridges mediumly developed, left parietal shows a wide region with rounded fissures and three circular perforations below, may be pathological in nature, right lateral side also shows such eroded areas. The whole skull is full of such large and small depressions.

The skull appears to be somewhat thicker than normal.

No measurements are possible.

*Mandible* (Pl. IX, Fig. 5)

Two fragments were found :

Br. Meg. VIII (a).—Fragment of the horizontal ramus at the gonial angle.

Br. Meg. VIII (b).—Fragments of the two mandibular arches showing the dorsal fold of bone only—without teeth sockets, appear to be smaller in size and robustness than fragment (a) described above.

Of the other long bones only measurements (in mm.) of the shaft of radius could be taken. They are as follows :

| | (a) | (b) |
|---|---|---|
| Sagittal diam. | 18 | 17 |
| Transverse diam. | 13.5 | 11 |

The above measurements will show the robustness of (a) in comparison to that of (b). The skeletal materials show however the presence of two individuals one robuster than the other.

The slender individual may probably, be identified as a female, evidence of which though not very much evident in the skull, appears to be present in the mandible, radius, femur and tibia.

**Br. Meg. X.**

This megalith is represented to us by only a few long bones, the details of which are given in List No. 1

No measurements of any fragment are possible.

**DENTAL CHARACTERISTICS**

The dental peculiarities of the skeletons from megaliths require a separate treatment. The large size of the mandible, the maxilla, with its broad, deep to shallow glenoid fossae, and above all the large and strong teeth, all point to the powerful chewing muscles of the megalithic people.

**A MAXILLARY MOLARS**

**Br. Meg. I., Skull B.**—All teeth highly worn out, particularly the two I molars show a marked wearing resulting into an angular slope towards the lingual border, which is particularly marked on the right side. This has been a great bar to the correct measurement of the labio-lingual diameter. No cusps are visible on I molars, 3 cusps on the II, while the III molars are unerupted on either side. The four incisors are also peculiar in not showing a sharp angular cutting edge, rather the incisive margins show an almost rectangular surface.

**Br. Meg. I., Skull D.**—Child's maxilla—I permanent molar erupted, crown of the II just visible, right I molar slightly worn out, 4 cusps in each.

**Br. Meg. I., Skull F.**—Fragment of left upper jaw, I molar highly worn out on the lingual border, no cusps visible, shows an uneven surface towards mesial border, causing a depression at the distal end; II molar though worn out shows 3 cusps with pit-like depressions.

**Br. Meg. I.**—Left maxillary fragment, I molar highly worn out with small bits of enamel chipped off, no cusps visible.

**Br. Meg. VII (2)**—Right III upper molar, with 3 roots and 4 prominent cusps showing Y4 pattern.

**Isolated III Molar**—Found in the same box containing remains of urn burial No. Br. 21. U.B.2—right (?), roots fused and bent, 3 cusps slightly worn out.

**B MANDIBULAR MOLARS**

**Br. Meg. I.**—Left III molar on a fragment of mandible, highly worn out, forming a deep concavity, deepest at the lingual border, causing a sharp raised point at the mesio-lingual corner.

**Br. Meg. I.**—Mandible of a child, probably belonging to skull D, shows two permanent I molars, 5 cusps, slightly worn out at the right.

**Br. Meg. IV (b)**—Left II molar, roots broken, 4 cusps, show medium wearing, labial cusps show oval pit-like depression whereas the two linguals are not so deep as the labials but are circular in shape.

**Br. Meg. V (a) & (b)**—Right III molar, highly worn out, no trace of any cusp, bits of enamel chipped off from the distal end.

**Br. Meg. VII (2)**—Left II molar, slightly worn out, 4 cusps showing +4 pattern.

Table 6 shows the labio-lingual and the mesio-distal diameters of molar crowns and their crown indices have been worked out after Moorrees (1957).

It shows that in the case of maxillary molars the labio-lingual diameter appears to be greater than the mesio-distal one, in the case of skull B only, whereas in others the reverse of it is seen, the diameters being similar in the case of two III molars. The mandibular molars show greater mesio-distal diameters than the labio-lingual ones, they being similar in dimension in Br. Meg. V (a) & (b) only.

TABLE 6

**Measurements of Molar teeth from Megaliths (in mm.)**

A Maxillary Molars

**Br. Meg.—I**

| Molars | Skull B I Lt. | Skull B I Rt. | Skull B II Lt. | Skull B II Rt. | Skull D Child I Lt. | Skull D Child I Rt. | Skull F I Lt. | Skull F II Lt. | Br. Meg. VII (2) I Lt. | Br. Meg. VII (2) III Rt. | Isolate II Rt. (?) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Labio-lingual diameter ... | 11 | 12 | 12 | 11 | 7 | 8 | 8 | 10 | 11 | 10 | 7 |
| Mesio-distal diameter ... | 10 | 9 | 9.5 | 8 | 10 | 10 | 9 | 9 | 12.5 | 10 | 7 |
| Crown Index ... | 110 | 133.33 | 126.32 | 137.50 | 70 | 80 | 88.89 | 111.11 | 88 | 100 | 100 |

B Mandibular Molars

| Molars | (Skull D?) Child I Lt. | (Skull D?) Child I Rt. | Br. Meg. I III Lt. | Br. Meg. IV (b) II Lt. | Br. Meg. V (a) & (b) III Rt. | Br. Meg VII (2) II Lt. |
|---|---|---|---|---|---|---|
| Labio-lingual diameter ... | 7 | 7 | 11 | 8 | 11 | 8 |
| Mesio-distal diameter ... | 10 | 10 | 12.5 | 9.5 | 11 | 10.5 |
| Crown Index ... | 70 | 70 | 88 | 84.21 | 100 | 76.19 |

**STONE AXE CULTURE Br. 17. B1. B 10** (Pl. X)

This open burial yielded a nearly complete skeleton of a child about 12 years of age. Among the carpal bones two pisiforms were found which nearly confirm the above age. The skeleton was buried extended, lying on its back with the head towards the east (Wheeler 1947).

The skull was received in fragments but could be restored with the exception of fragments of right temporal, frontal and parietal and part of the left temporal as well. Cranial base was missing excepting the petrous portions of the two temporals. At the facial region the upper parts of the two orbits and parts of the malars were present.

Hyperdolichocranial (69.27), Chamaecranial (Rt-58.10; Lt-63.12).

*Norma Verticalis* (Pl. X, Fig. 1)

Elongated in outline, broadest at the well marked parietal tuberosities, occipital region shows a rounded bulge, sagittal and coronal sutures open, region at bregma somewhat distorted in shape due to the flatness of the parietals.

*Norma Lateralis* (Left) (Pl. X, Fig. 2)

Medium vaulted, forehead almost straight, with a slope backwards, glabella prominent, occipital region shows an abrupt slope above the region of lambda after which there is a pronounced circular bulge, mastoid small, supramastoidal crest present in trace.

Right side almost the same though a large portion is missing.

*Norma Occipitalis* (Pl. X, Fig. 3)

Almost pentagonal in outline, a number of foramina present at the region of the superior nuchal arch, muscular impressions weakly present.

*Norma Facialis* (Pl. X, Fig. 4)

Forehead nearly vertical with a backward slope, supraorbital ridges not marked, glabella prominent, orbits, of which the nasal borders are missing, rectangular; malars not prominent.

*Norma Basalis*

Only the petrous portion of the temporals present; glenoid fossae shallow.

The other bones of this skeleton were fairly well represented (*cf.* Table 1). The epiphyses of the long bones have not yet ossified. They were however measured (Table 7) for the maximum length without the epiphyses and for other measurements of the diaphyses in order to compare them with those of the other skeletons found in the urns of the Stone Axe Culture (Pl. X, Figs. 6-8).

however appears from the other characteristics of the long bones to be younger than C. 4. U.B. 2 but older than A. 4. U.B. 4, described below.

**Br. 17. A.4. U.B. 4**

This urn, as already mentioned, in List No. 2 (p. 10) contained remains of two children*, as evidenced by the thickness of two crania and rib fragments. Long bones of one individual were however found, which measure nearly half the length of Br. 17.C.4.U.B.2. As such this infant appears to be much below three years of age.

TABLE 7

**Diaphyseal Measurements of Long Bones from Stone Axe Culture (in mm.)**

| Measurements | | Br. 17 B 1 B.10 | | Br. 17 C. 4 U.B2 | | Br. 17 A4 U.B1 | | Br. 17 A4 U.B. 4 | | Br. 21. U.B.2 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. |
| Humerus: | Max. length | 175 | 175 | 127 | 128 | - - | | 67 | 67 | 106 |
| | Circum. of shaft (upper third) | 40 | 40 | 35 | 36 | - | - | 24.5 | 25 | 35 |
| | Least circum. of shaft | 38 | 37 | 33 | 33 | — | — | 19 | 20 | 31 |
| Radius : | Max. length | — | — | 101 | 101 | — | | — | — | - - |
| Femur : | Max. length | 243 | 245 | 170 | 169 | — | - - | 79 | 79 | |
| | Prox. dorso-ventral diam | 20 | 19.5 | 16 | 15 | 13 | — | 9 | 9 | - |
| | Prox. med lat. ,, | 22.5 | 22 | 20 | 19 | 14.5 | — | 9 | 9 | |
| | Med. dorso-ventral ,, | 16.5 | 16.5 | 10.5 | 11 | 10 | 10 | 6.5 | 6 | |
| | Med. med lat. ,, | 15 | 16 | 12 | 12.5 | 13 | 13 | 7 | 7 | |
| | Med. circum of shaft ,, | 52 | 52 | 40 | 39 | 36 | 36 | 21 | 21 | — |
| | Dist. dorso ventral ,, | - - | 17 | — | 11 | 10 | 10 | 9 | 9 | — |
| | Dist. med-lat. ,, | 36 | 34 | - | 29 | 23 | 23 | 16 | 16 | |
| Tibia : | Max. length | 212 | 211 | | 141 | — | — | - | 69 | |
| | Prox. dorso-ventral ,, | 22 | 23 | — | 17 | | | | 7 | |
| | Prox. med-lat. ,, | 20 | 20 | — | 16 | - | | | 9 | - |
| | Med dorso-ventral ,, | 18 | 18 | - | 12.5 | - - | - | | 8 | - |
| | Med. med lat. ,, | 14 | 13 | | 11 | - - | — | - | 7 | |
| | Dist. dorso ventral ,, | 19 | 19 | — | 15 | | | 10 | 9 | |
| | Dist. med-lat. ,, | 18.5 | 18 | - - | 16 | — | — | 10 | 9 | - |
| | Least circum. of shaft | 49 | 48 | | 36 | — | - | 23 | 22 | |

**Br. 17. C.4. U.B. 2.**

Child, about 3 years old. Among the tarsals, a navicular, an intermediate cuneiform and a lateral cuneiform were found. No carpals.

As will be evident from Table 7 the long bones are much smaller than those of the skeleton, No. Br. 17.B.1.B.10.

**Br. 17. A.4. U.B. 1.**

Infant skeleton, all long bones broken as such no measurements of the diaphysis were possible. It

**Br. 21. U.B. 2.**

This infant is represented by a very few bones in comparison to those stated above. It was represented by only one humerus which measures 106 mm. and thus appears to be intermediate in development between A.4. U.B.4. and C.4.U.B.2.

**ETHNIC AFFINITIES**

In view of the paucity of the skeletal remains and also due to their fragmentary and deformed nature, a detailed discussion on the ethnic affinities of the Brahmagiri finds will be rather tentative in nature.

* It may be a later mix-up.

Br. Meg. I has yielded four skulls (A, B, C, and F) in a comparatively better state of preservation and they appear to show some interesting ethnological pointers. These four skulls vary between the cranial index of 78.21 and 83.52 (Table 2), thus giving a mean index of 80.40. The length-auricular height index varies between 57.82 and 63.69, showing a mean of 61.27. The mean breadth-auricular height index is 76.23 with the minimum range of 73.36 and the maximum of 80.48. The nasal index is available for three crania, A, B and C, which shows a mean of 58.83, the range varying between 52.94 and 62.50. Thus in general the average of the four crania appears to be on the border of meso and brachy in cranial index; orthocranial in length-auricular height index; tapeinocranial in breadth-auricular height index; and hyperchamaerrhine in nasal index.

These four skulls agree with one another in a large number of morphological characters, as will be obvious from our previous descriptions. The range of variation is small for each of the above four indices. These considerations probably point out to a familial similarity of the above four persons. Crania A and F appear to be somewhat older than B and C, since the sutures at the pterion appear to have closed in both the former skulls. This familial relationship is also obvious from the superimposed median sagittal craniograms of the crania A, B and C (Fig. 1.) —

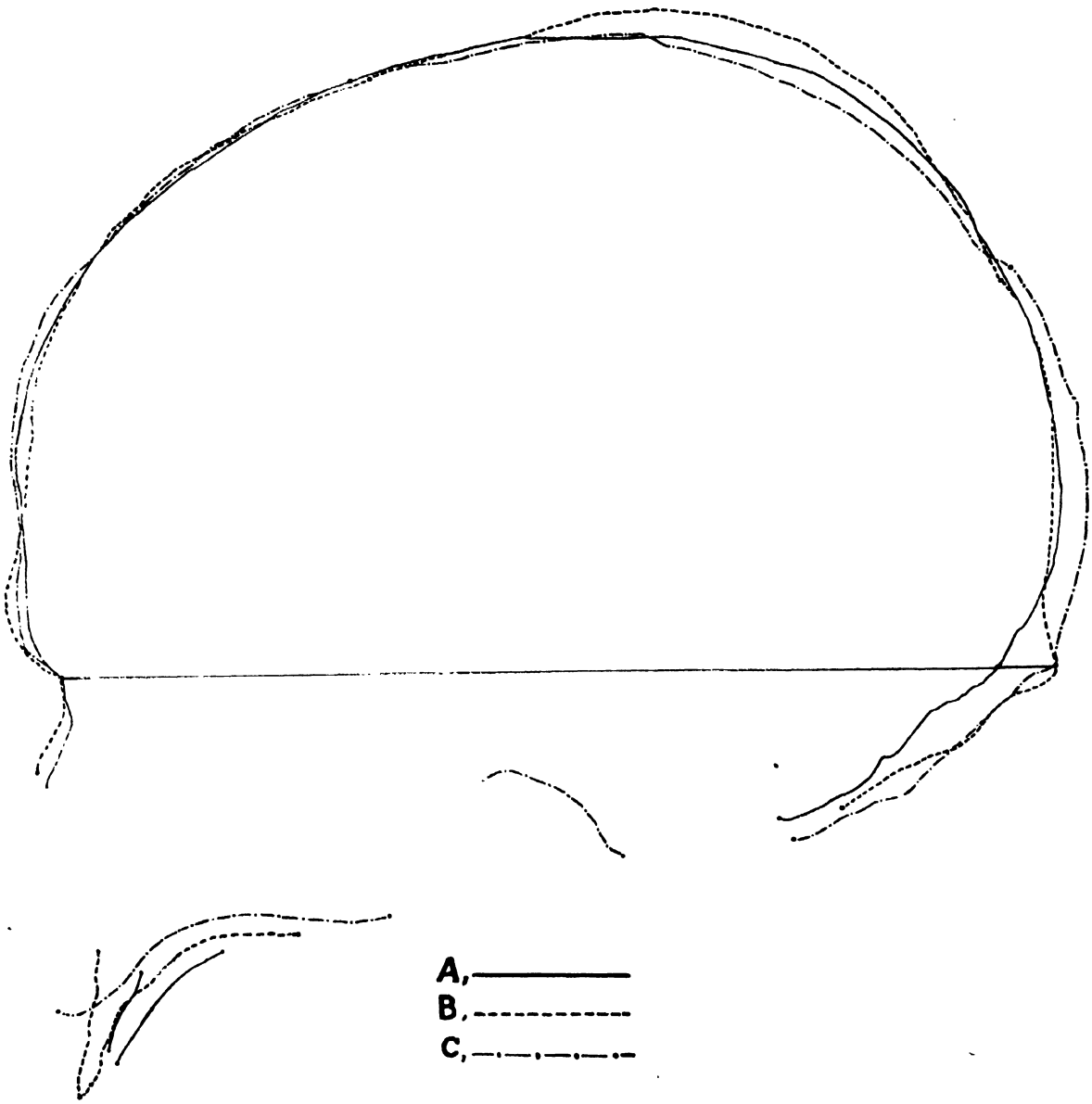



**Fig. 1**
**Median Sagittal Craniogram of 3 Crania from Br. Meg. I.**

that of skull F could not be drawn because of its fragmentary nature. The cranial capacity of skull C only could be calculated, which according to Lee-Pearson formula, appears to be 1513 cc. and is thus of the large type, according to the classification of Keith and Krogman (1932). According to Sergi it falls within the megalocephalic range.

Only two femora (Table 4) could be utilized for the determination of stature. According to Lee-Pearson's male formula they show a stature of 1699.60 mm. (5 ft. 8 in.) for the femur, numbered (c), and 1621.40 mm. (5 ft. 5 in.) for that numbered (a). The two individuals therefore appear to be above medium and below medium in stature respectively. The robustness of the skeletal parts, the prominent malars, the mandibular fragments and the highly worn out teeth also indicate a very strong physical type. The mandibular fragment (Table 3) from Br. Meg. V appears to support the prevailing type represented by the above four individuals.

The cranial characters mentioned above do neither agree with the autochthonous Australoid type of this country nor with the Indo-Aryans, and the ethnic type represented by the above four skeletons appears to be foreign in origin.

A contrary picture is however seen in the adult cranium E, probably a female, and the child cranium D, both found in association with the above four individuals in Br. Meg. I. The former skull appears to be hyperdolichocranial (64.22 ?), chamaecranial (62.30), metriocranial (77.15 ?), and the low nasal index is probably unreliable. There is marked difference in the shape of the occiput and the post-auricular development of the skull is nearly equal to the pre-auricular, this character being also present in crania A and C. The child skull also appears to show some similarity with the skull E in respect of the occipital surface though, due to its tender age and the very deformed nature, nothing definite could be said. Crania D (child) and E appear to possess some common elements and they probably represent the autochthonous Australoid element of this country. Meadows Taylor (1865) described a very long head with prominent eyebrows and marked prognathism in a skull from Cairn E at Jewuri. He also measured the stature of the largest skeleton from Cairn A to be between 5 ft. and 5 ft. 6 in.

Hunt (1924) found 5 crania from Raigir megaliths, of which 3 showed an index of 75, one female that of 76, while the fifth showed a high brachycranial index of 90. He also estimated the stature of these cairn builders to be about 5 ft. 6 in. The association of the different head forms is thus borne out from other megaliths in this country. Human remains from the above megaliths are no longer existing and in this respect Brahmagiri remains are valuable.

How are we to account for the association of the individuals with such divergent ethnic characters in the same megalith? It is probably a case of hybridization. It appears that each megalith at Brahmagiri is a family vault and this fact can be fairly well seen in other megaliths as well. Br. Meg. IV shows remains of two adults, one of whom appears to be a slender-built person and there is also a child cranium. Br. Meg. V also contains remains of a less robust person besides a robust one and an infant. Br. Meg. VIII also shows remains of a female besides an adult male. If these slender-built or less robust persons are females, for which there is a good deal of probability, it is seen that four out of five cist-circles appear to be family burials. Unfortunately all the 17 crania, mentioned by Wheeler, are not available to us, otherwise more would have been known.

Who are then these brachy-mesocephalic people? Besides this form of head they are also characterized by more or less medium stature, robust constitution and platyrrhine nose.

Ariens Kappers (1934) has identified the 77-79 cephalic index people to be Scytho-Iranians. This cranial index people appears to be present at period III of Tepe Hissar. Kappers is of opinion that the great migration of these Scytho-Iranians occurred between 1000 and 2000 B.C. from the region of Ukraine. The present Iranian population also shows this index in a very high frequency and the majority of the Kurds, the Aderbeidjani and others fall within this category. The northern Persians are very much influenced by the Caucasic influence and are characterized by the brachycephalic index of 83. In this connection the human remains from Sialk (Vallois 1940) also deserve mention. Of the 39 crania excavated from the periods I-VI at Sialk only five are mesocranial. Of these five, two are females, showing the indices of 79.0? and 74.1 ?, one belongs to a child, 8-10 years old, with an index of 76.0, while the two male skulls show the indices of 79.2? and 75.7. Brachycephaly is overwhelming at period VI, where out of 18 skulls found, 15 are either brachycephalic or hyperbrachycephalic. Mesocephaly is thus poorly represented at Sialk and its brachycephaly may be responsible for the brachycephaly of Brahmagiri. This is also borne out by the very close similarity of the Brahmagiri skull B with that published by Vallois in his Plate C, fig. 5. Al-

though the former skull belongs to a male and the latter to a female, the similarities are very much apparent in the cranial contour excepting the frontal region.

Kappers has also published a cranial index curve of the Kurgan skulls of the 10th and 11th century A.D. from Central Russia, originally published by Bogdanow. In the present megalithic context they also deserve some mention. Kappers' curve for the crania of both the sexes shows the most outstanding peak at 75 with a frequency of 22 crania, followed by another at 71 with a frequency of 19 crania and then there are two other peaks of the equal frequency of 16 crania at 78 and 80. Out of these 188 crania from the four Russian Kurgans of Twer, Merjanen, Bolgary and Nowgorod, 80 or 42.6% appear to be mesocephalic, 61 or 26.0% are dolichocephalic and the rest are brachycephalic. Nearly the same picture is also seen in the crania from Ukraine, in the male Scythian Kurgan skulls found near Kiev and in the Kurgan skulls from Caucasus. From all these evidences Kappers concludes: 'The 75 peak certainly indicates a people different from our Indo-Aryan'. The latter are characterized by the 71 index cranial peak and there is little evidence of this ethinc strain at Brahmagiri.

In an earlier publication (Sarkar, 1958) the ramifications of these mesocephalic people among the present day populations of India were discussed and Brahmagiri falls within this geographical area. How far Sir Arthur Keith's famous dictum, 'we find people at the dawn of history pretty as much as they are today', already proved to be true elsewhere, will also be true at Brahmagiri, only further researches on its present day inhabitants will reveal. The Brahmagiri mesocephals are probably close congeners of the 77-79 index people, so frequently seen in Central and Western India.

The child skull (Table 2) from Stone Axe Culture is hyperdolichocranial (69.27), orthocranial (59.50) and metriocranial (85.89) in shape and appears to be Australoid in form.

Thanks are due to Sreemati Bela Sinha and Sreemati Papia Bhattacharjee for their kind help and advice in the restoration of the skeletal materials and in the preparation of this report.

**SUMMARY**

1. *Archaeological excavations at Brahmagiri have yeilded 10 megaliths and a large number of urn burials and an open burial of a child about 12 years old, the latter two belonging to the Stone Axe Culture.*
2. *Human remains were found from 6 megaliths, Br.Meg. Nos. I, IV, V, VIII and IX, all of which are cist-circles, while pit-circle VII yielded remains of three individuals. Urn burials were represented by 5 skeletons of infants, all of whom appear to be below 3 years of age.*
3. *Each megalith appears to be a family vault, since remains of more than one individual were found in each.*
4. *12 skulls were received for purposes of this report although the number of individuals appears to be 20 in all.*
5. *The crania from megaliths reveal an autochthonous Australoid type and a more or less medium statured, mesocephalic, medium-vaulted, flat-nosed type with robust constitution and powerful upper and lower jaws, probably of the Scytho-Iranian stock.*
6. *The single child skull from the Stone Axe Culture appears to be of the autochthonous Australoid type.*

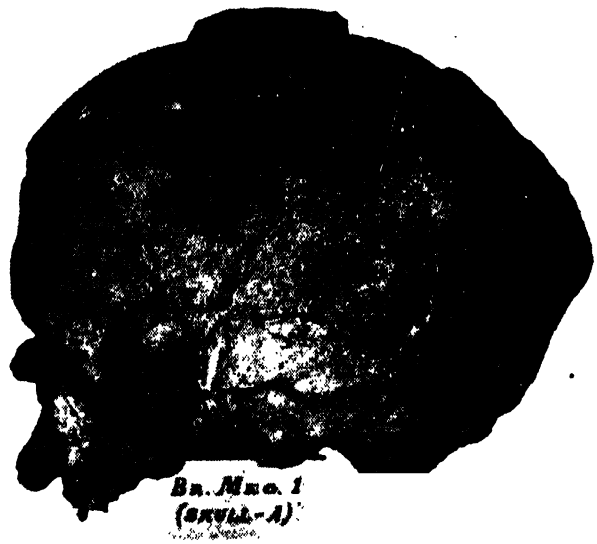



**Fig. 1.** Before Restoration

**Fig. 2.** *Norma Verticalis*

**Fig. 3.** *Norma Lateralis*

**Br. Meg. I (Skull A)**

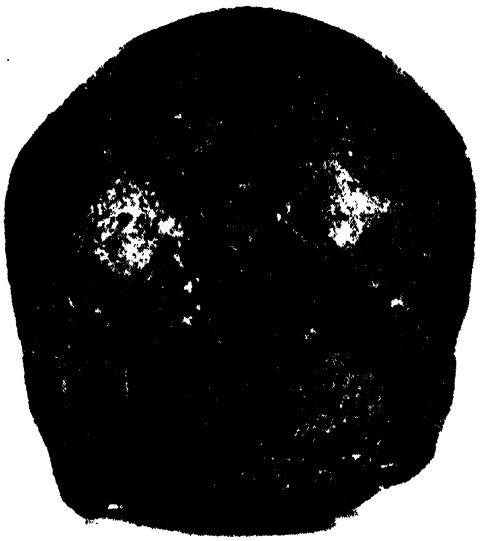


Fig. 4. *Norma Occipitalis*

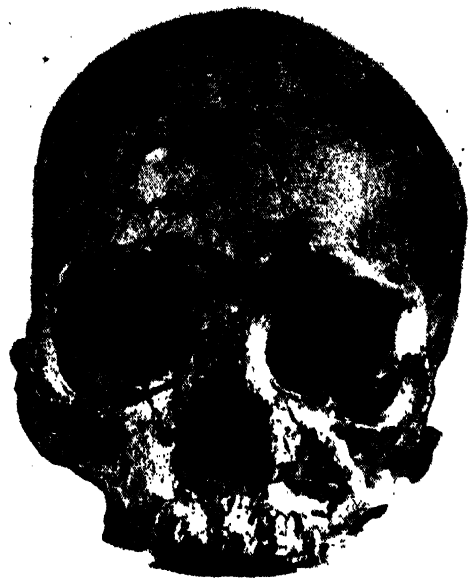


Fig. 5. *Norma Facialis*

Fig. 6. *Norma Basalis*

Br. Meg. I (Skull A)

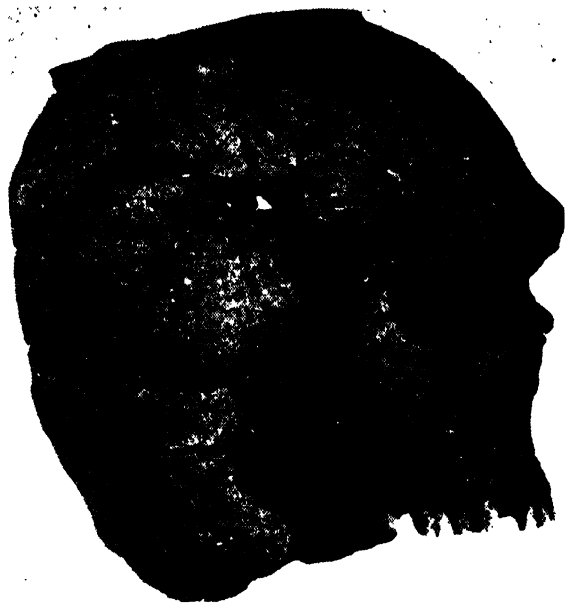


Fig. 1. Before Restoration

Fig. 3. *Norma Verticalis*

Fig. 4. *Norma Lateralis*

Br. Meg. I (Skull B)

Fig. 2 excluded

Fig. 5. *Norma Occipitalis*

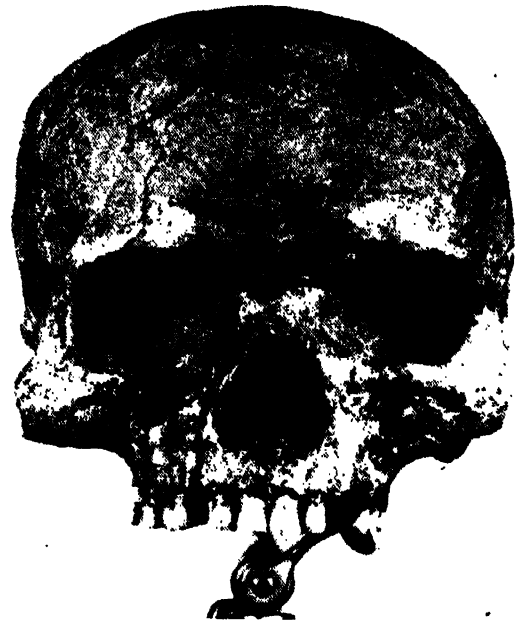


Fig. 6. *Norma Facialis*

Fig. 7. *Norma Basalis*

Br. Meg. I (Skull B)


Fig. 1.


Fig. 2.

Before Restoration

Fig. 3. *Norma Verticalis*

Fig. 4. *Norma Lateralis*

Br. Meg. I (Skull C)

**Fig. 5.** *Norma Occipitalis*

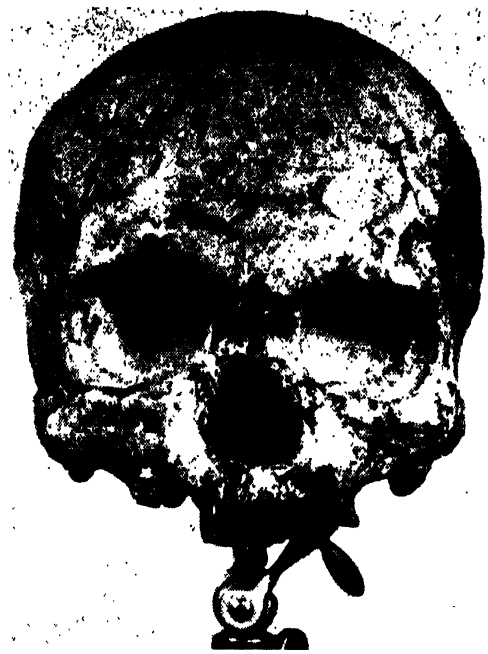


**Fig. 6.** *Norma Facialis*

**Fig. 7.** *Norma Basalis*

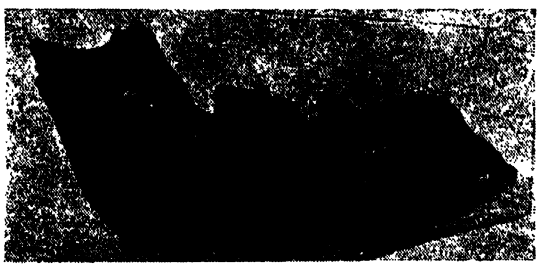
Br. Meg. I (Skull C)

**Fig. 1.** *Norma Facialis*

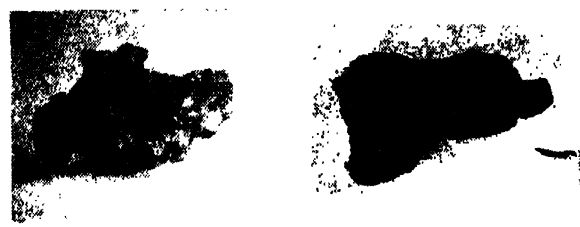
**Fig. 2.** Showing Palate and Dentition

**Figs. 3-5.** Showing different views of a Child's Mandible

**Br. Meg. I (Skull D)**



**Figs. 6-8.** Showing different views of Adult's Mandible



**Figs. 9-10.** Showing different views of an isolated Maxilla

**Br. Meg. I**

**Fig. 11.** Maxillary fragment of Skull F

**Fig. 1.** *Norma Verticalis*

**Fig. 2.** *Norma Lateralis*

**Fig. 3.** *Norma Occipitalis*

**Br. Meg. I (Skull E)**

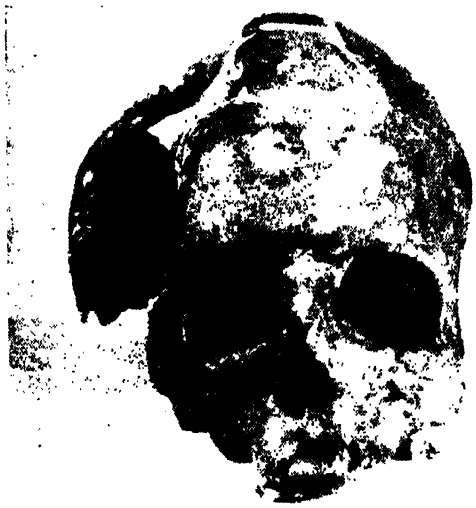


**Fig. 4.** *Norma Facialis*

**Fig. 5.** *Norma Basalis*

**Br. Meg. I (Skull E)**

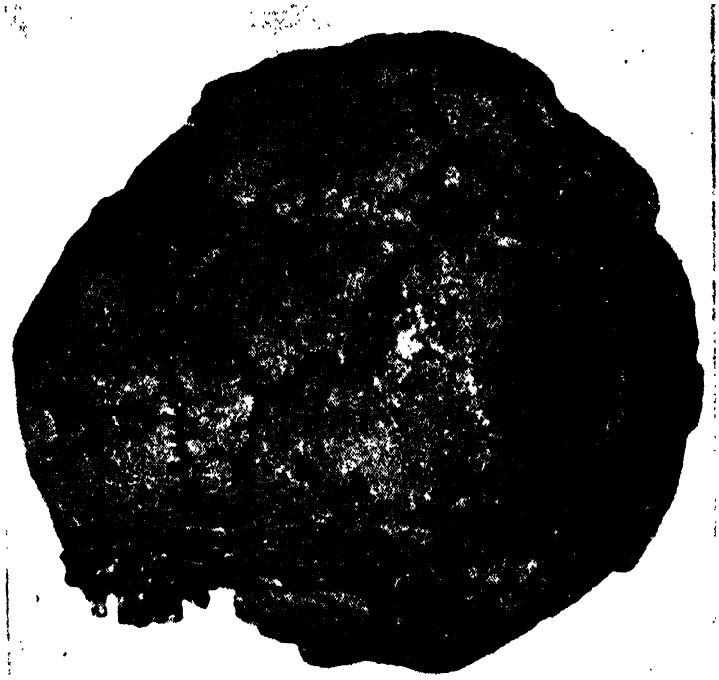


Fig. 1. Before Restoration

Fig. 2. *Norma Verticalis*

Fig. 3. *Norma Lateralis* (Left)

Fig. 4. *Norma Occipitalis*

Br. Meg. I (Skull F)


**Fig. 5.** Fragments of *Humerii*


**Fig. 6.** Fragments of *Ulnae*

Fig. 1. Dorsal views of *Femora*

Fig. 2. Ventral views of *Femora*

**Fig. 3.** Dorsal views of *Tibiae*

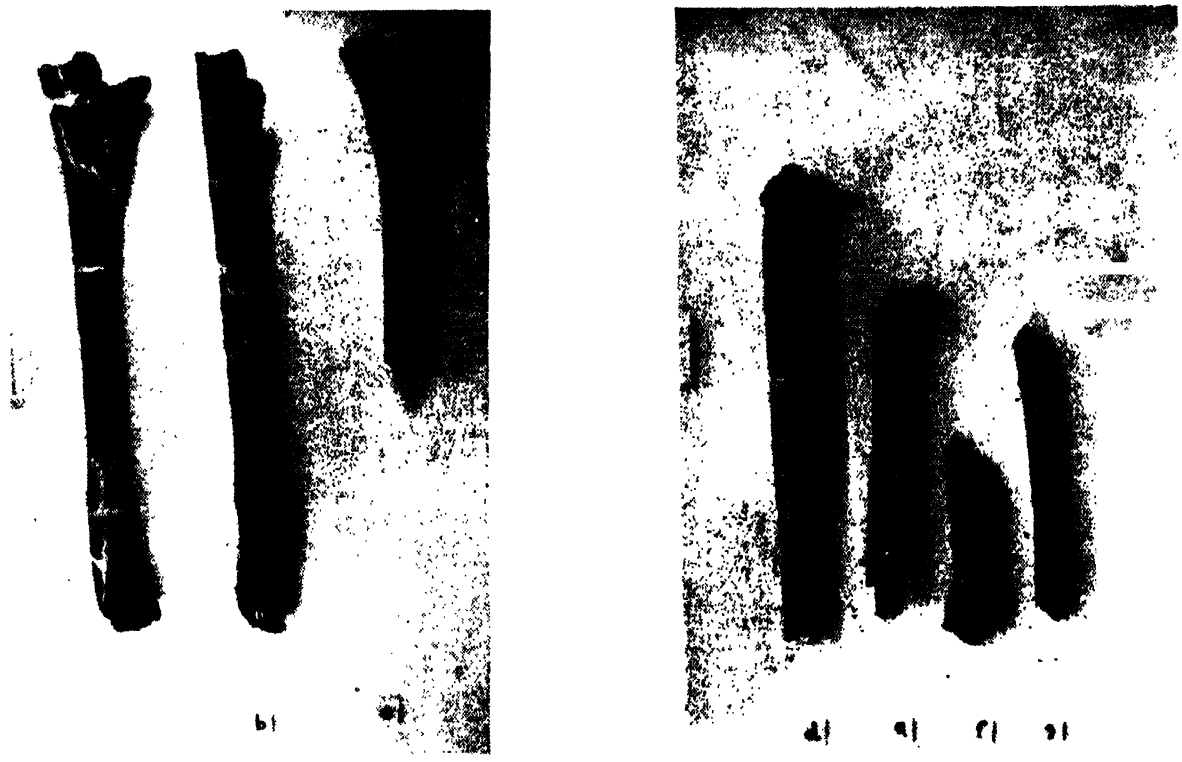


**Fig. 4.** Ventral views of *Tibiae*

Fig. 1. *Norma Verticalis*

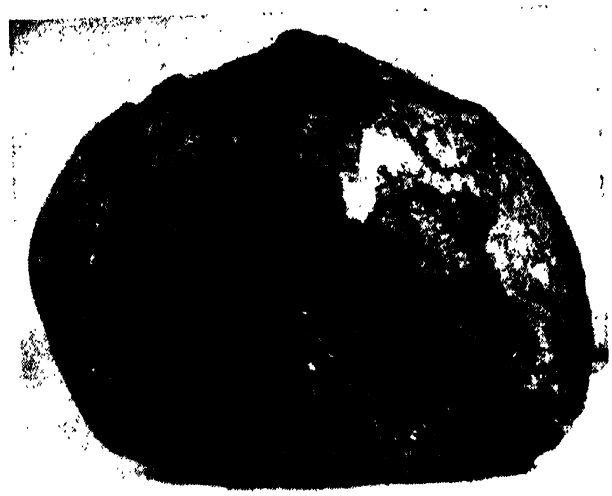


Fig. 2. *Norma Lateralis*

Fig. 3. *Norma Occipitalis*

Br. Meg. IV (Skull C)

**Fig. 4.** Fragments of Adult and Child Crania

**Figs. 5-7.** Different views of Mandible

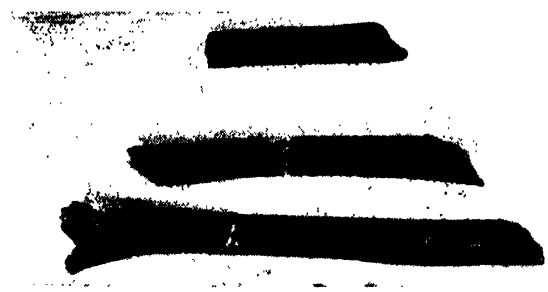


**Fig. 8.** Shaft Fragments of *Humerii*

**Fig. 1.** Fragmentary Skull of a Child (a)

**Fig. 2.** Fragmentary Skull of an Adult (b)

**Br. Meg. VII (1)**

**Fig. 3.** Fragmentary Skull of an Adult

**Br. Meg. VII (2)**

**Fig. 4.** *Norma Verticalis* of a calotte

**Br. Meg. VIII (b)**

**Fig. 5.** Fragments of Mandible

**Br. Meg. VIII (a) & (b)**

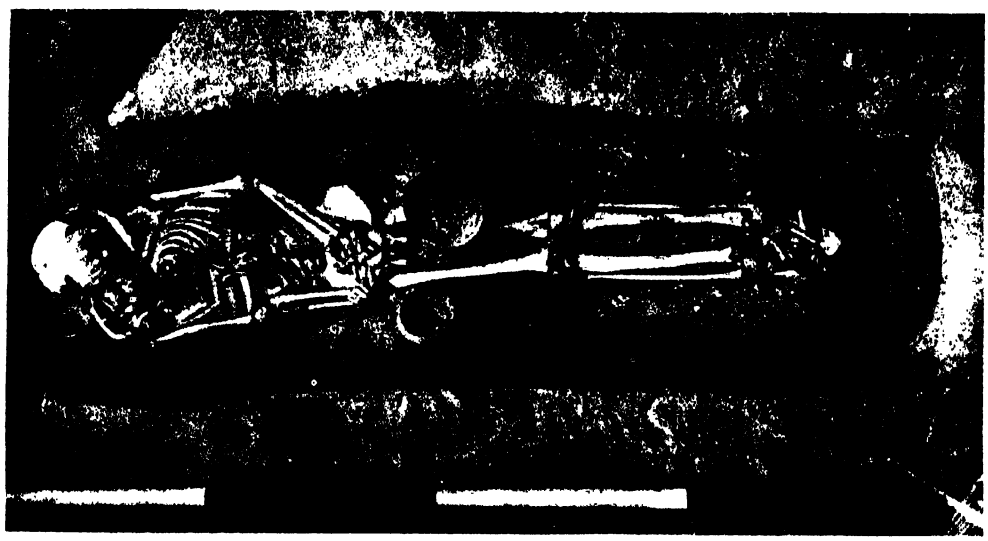


**Fig. A.** Open Burial No. Br. 17. B.1.B.10 (Stone Axe Culture)





*( Please see also Plate X )*

**Fig. 1.** *Norma Verticalis*

**Fig. 2.** *Norma Lateralis*

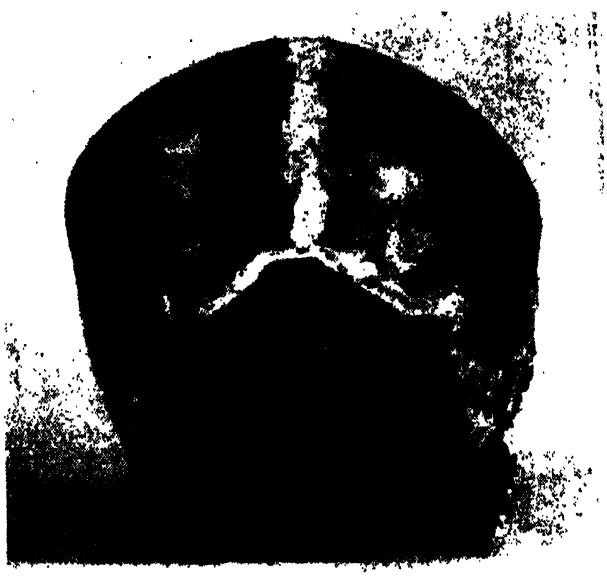


**Fig. 3.** *Norma Occipitalis*

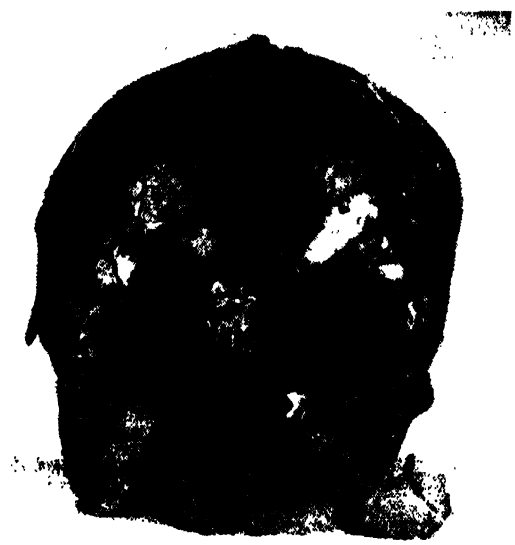


**Fig. 4.** *Norma Facialis*

Fig. 5. *Norma Basalis*

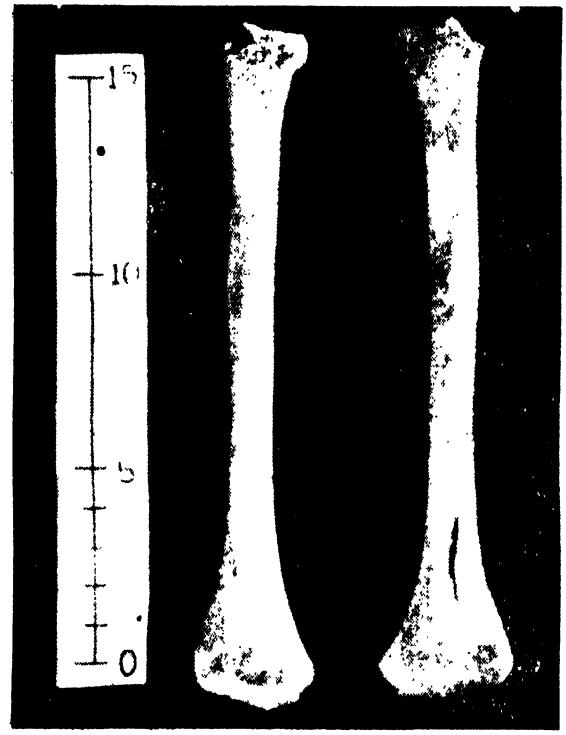



Fig. 6. *Humerii* from Stone Axe Culture


Fig. 7. *Femora* from Stone Axe Culture

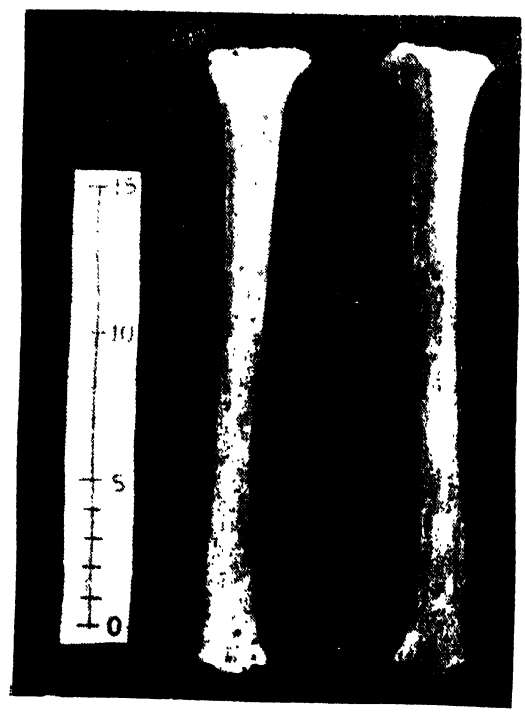



Fig. 8. *Tibiae* from Stone Axe Culture

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# A STUDY ON ONGE SKELETONS FROM LITTLE ANDAMAN

## PART ONE

PABITRA GUPTA, ARABINDA BASU AND ANIMA GUPTA

( *Received on June, 1959* )

### INTRODUCTION

The Onge skeletons at our disposal is a collection of the Department of Anthropology, Government of India, from the island of Little Andaman situated between 10°30'N and 11°N latitude and 92°15'E and 92°45'E longitude. These were collected during the months of March and April in the year 1954 from old and deserted communal hut at *Tambebuea*. The Onge of Little Andaman bury dead bodies under the bed of the deceased inside their own communal hut. The corpse is flexed in embryonic position covering both the eyes and the face with its palms. The body is tied with cane-strip or bark-strip, and laid down in a dug out hole on its right side generally with the head directed towards the sea. After placing the corpse in the grave the entire body is shrouded with *Lieniala* palm leaves before it is covered with earth. Nothing is given in the grave as offering.*

Never before, any Onge skeleton has been studied, this being the first authentic series to be reported on. The only record of collection of Onge skeleton is that of Eickstedt (1928) who collected eight skulls, one mandible, one complete skeleton and a brain in 1927 from Little Andaman, but no report on those materials has been published so far by him.

The aboriginals of Andaman Islands belong to same negrito racial stock, although the Onge– Sentinelese–Jarwa groups differ to a certain extent so far language and culture are concerned (Guha 1954).

The present paper contains the morphological observations as well as the measurements of two skeletons only. The rest are described separately in this issue. The skeletons are not in a very good state of preservation and fragments had to be chemically treated and restored before study.

Although no Onge skeleton has been studied so far, Andamanese skeletons have been studied by Quatrefages, Owen, Duckworth, Pycraft, Flower, Cappieri, Sulivan, Busk and others.

In this paper the measurements and drawings are mainly done according to Martin's techniques (Martin and Saller 1956 and 1957), except otherwise stated. All the measurements have been taken several times by the writers to avoid error to the least possible.

### MATERIAL

The material available for the two Onge skeletons is enumerated below :

| | |
|---|---|
| **Onge skeleton** | L.1. Adult, female. |
| *Skull* | Complete. |
| *Vertebrae* | Three cervical vertebrae; eight dorsal vertebrae and one spinous process belonging to one of these; and all of the lumbar vertebrae are represented. |
| *Ribs* | Represented by number of fragmentary parts of both right and left series. |
| *Scapulae* | The left scapula is represented by the upper three-fourths of the axillary border, glenoid fossa, superior angle, coracoid process and spine with the acromial end. The right includes almost entire axillary border with a damaged inferior angle, |

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* Information given by Shri Bimal Roy, Senior Technical Assistant, Department of Anthropology, who observed the disposal of death on several occasions during his stay among the Onge.

| | |
|---|---|
| | glenoid fossa, acromial part with the spine and the superior angle. |
| *Claviculae* | The right bone is nearly intact, but the sternal articular surface is slightly damaged. The left bone lacks the acromial end. |
| *Humerii* | Right bone complete. The left bone consists of the distal end and the shaft; the proximal extremity is missing. |
| *Radii* | Neither is preserved. |
| *Ulnae* | Both right and left comprise the proximal ends and nearly the whole of the shaft, but lack the distal ends. |
| *Hands* | Represented by two metacarpals and one proximal phalanx. |
| *Pelvis & Sacrum* | The right os coxae is represented by the greater part of the ilium, including acetabular cavity, upper extremity of the ischium and a portion of the superior ramus of the pubis. Left os coxae is complete except for pubis symphysis. The sacrum is incomplete. |
| *Femora* | The right bone is complete. The left bone lacks the head and neck portion. |
| *Tibiae* | Both complete, but proximal epiphyseal end being slightly damaged. |
| *Fibulae* | Both nearly complete except for proximal ends. |
| **Onge skeleton** | L.5. Adult, female. |
| *Skull* | Nearly complete. |
| *Mandible* | Coronoid and condyloid proceses are slightly broken on both sides; otherwise complete. |
| *Vertebrae* | Cervicals 1—6 are relatively intact but the seventh cervical is broken. All of the dorsal and lumbar vertebrae are represented. |
| *Ribs* | Several fragmentary parts of both the halves are present. |
| *Scapulae* | The left scapula is nearly intact, the chief defects being the region of supra-spinous fossa and the inferior angle. The right scapula is represented by the upper two-thirds of the axillary border, a broken spine and a small portion of the glenoid. |
| *Claviculae* | Both right and left bones are complete. |
| *Humerii* | Both bones are complete. |
| *Radii* | Left complete. The right radius comprises the distal end and nearly the whole of the shaft, but lacks the proximal end. |
| *Ulnae* | Right complete. The left bone has the whole of the shaft but the entire olecranon is lacking. |
| *Hands* | Neither carpus is preserved. There are five metacarpals and three proximal phalanges. |
| *Pelvis & Sacrum* | The right os coxae is represented by complete ilium, with part of the acetabulum and pubis ramus of that side. The sacrum and left os coxae are complete. |
| *Femora* | Both complete, the greater trochanter of the left bone being damaged. |
| *Tibiae* | Both complete, but proximal ends of both the sides are slightly damaged. |
| *Fibulae* | The right fibula is complete. The left bone lacks the proximal end. |
| *Feet* | Represented by six metatarsals (including both first metatarsi), right and left calcaneus and left talus. |

## MORPHOLOGY OF SKULLS

Both the skulls (pl. I - V) show marked uniformity of morphological traits excepting in some details.

The skulls are small, gracile, smooth-contoured, light and thin-walled, with very weakly developed muscular ridges. The vault sutures are all open, but the basilar one is united.

When viewed from above, the skull L.1 looks *sphenoides* and the L.5 *rhomboides*. Both are phaenozygous. Parietal bosses are more prominent in L.5 than L.1.

Supra-orbital ridges are imperceptible and mastoids are rudimentary in both.

Forehead is medium in height and breadth and slightly receding in L.1, whereas it is low, narrow and straight in L.5. In both glabella is hardly perceptible. Orbits tend to be rectangular in the former skull while it is roundish in the latter with sharp upper borders in both the cases. Orbits are high. Inter-orbital space is notably broad and the root of nose is not depressed. Nasal bridge of skull L.1 shows some concavity. Nasal bones are short and flat in both. Nasal aperture is *pyriform* in L.1 and *ovaloid* in L.5. Inferior border of the nasal aperture is *dull* or *amblycraspedotic* indicating primitiveness.

Malar bones are sub-medium in size and show slight degree of anterior projection. Zygomatic arches are slender.

Canine fossae are deep in skull L.1 and shallow in L.5. Jugum-alveolum space is medium in L.1 and high in L.5.

The morphological observations of the two crania reveal that the faces are low and broad and distinctly prognathous. Following Flower, as done by Keith (1927), the degree of prognathism may be expressed by contrasting basi-alveolar and basi-nasal length, the difference between them being slightly greater in skull L.1.

Viewed from side, some lambdoid flattening appears on the skull L.5. *Occiput-en-chignon* is visible in the same skull, followed by a sharp retreat of the nuchal portion, which is an interesting and noteworthy feature in a brachycranial skull.

In both the skulls *pteryon* is spheno-parietal ; it is medium in skull L.1 and narrow in L.5. Sutural bones are present at the lambdoid suture.

Architecture of the basilar part is not complicated. Palate is parabolic in skull L.1. and 'U' shaped in L.5. Palatal depth is medium. Full set of teeth has erupted in L.5 ; excepting the molars, others are lost due to post-mortem falling. Skull L.1 has all the teeth intact excepting the 3rd molars which have not erupted. Teeth show marked attrition of surfaces. Keith (1927) has suggested admixture of dust or grit with food particle as the chief cause of dental attrition. Incisors are shovel-shaped and post-molar space is short in L.1. The maxillary molars of skull L.5 are quadricuspid except the right third, which is tricuspid.

An interesting and important feature which these skulls offer, is their possession of large and somewhat flattened glenoid fossae. This characteristic feature suggests a side-to-side movement of the mandible. Tympanic part of the temporal bone is relatively large with sharp margin which contributes towards the formation of the glenoid fossa. Another important observation of this region is the presence of distinct transverse Glaserian fissure.

**MANDIBLE**

The mandible (pl. VI) belonging to the skull L.5 is medium in size and strength. The condyloid and the coronoid processes of both the sides are broken. The ramii are medium. Surface is almost smooth. It is evident that all the molars have erupted, of which five molars still remain intact the other being lost post-mortem. The attrited molars had bared pulp cavities and are quadricuspid. Chin is pointed. Alveolar prognathism is present. Sigmoid notch is deep. Mylohyoid ridge and fossa are ill-developed, so also the genial tubercle. Measurements are given in Table 11.

**FORM OF THE SKULL**

Table 5 shows that the skull L.1 is *brachycranial* (83.13) and the skull L.5 is *hyperbrachycranial* (85.19) both tend to converge at the *brachy* —and *hyperbrachycranial* border line. It appears from Table 1 that the absolute lengths of both the skulls are quite short (160 mm and 162 mm respectively) and breadths are similarly small (133 mm and 138 mm respectively). In this connection, it may be mentioned here that the cephalic indices of the living Onge measured by Eickstedt (1928) and Guha (1954) give average values of 83.10 and 83.01 respectively for females and 83.50 and 83.09 respectively for males showing their brachycephaly.

Both the skulls are high-vaulted in relation to length and breadth though the absolute measurements for auricular height are low. The heights being measured with Davidson Black's Callotemeter placing the skull on Mollison's Craniophore, show almost equal values in both (104.5 mm and 105 mm).

The length-height index in both place them in the *hypsicranial* class (the indices being 76.56 and 78.09 for L.1. and L.5. respectively). The extent of *sub-auricular* region (projective distance between porion and basion) is great in both the skulls (18 mm and 21.5 mm for L.1 and L.5 respectively) suggesting a mark of strength and primitiveness (Keith 1927).

The breadth-height relation shows the skulls L.1 and L.5 to be *metrio*—and *tapeinocranial* respectively, though skull L.5 tends towards the

*metriocranial* class (indices are 92.11 and 91.67 respectively).

In skull L.5 the forehead is much narrow in relation to its maximum breadth thus placing it in the *stenometop* class as revealed from the fronto-parietal index (62.32). Skull L.1 shows relatively higher index value and belongs to the *metriometop* class (68.42).

### CRANIAL CAPACITY

Cranial capacity of these two Onge female skulls are 1126.66 cc and 1152.50 cc for L.1 and L.5 respectively. When classified after Sergi they belong to *microcephal* and *elattocephal* group respectively, skull L.5 exceeds the *microcephal* range by 2.5 cc only, showing its tendency towards *microcephaly*. Cranial capacity was measured following Mollison's (1938) mustard seed method and results were obtained by taking the mean values of three readings for each skull.

### MODULUS

Cranial modulus of the skull L.1 is 138.50 mm and that of L.5 is 142.17 mm. It gives an impression on the smallness of the size of the *neurocranium* of the two female Onge skulls.

### FACIAL CHARACTER

Table 6 reveals that both the skulls have *chamaerrhine* nose, their indices being 54.55 and 57.83 for L.1 and L.5 respectively, the tendency of L.5 is, however, towards *hyperchamaerrhine*. Among the living female Onge the nasal index is 82.07 and among the male it is 83.64, both being in the *mesorrhine* class, as measured by Guha (1954). Nasal bones, when measured (Gates 1956), appear small as seen in Table 3.

Both the skulls show alveolar as well as facial prognathism as determined by facial profile and alveolar angles (Table 13).

In skull L.1 orbit is *hypsiconch* and in L.5 is is *mesoconch* with a tendency towards high orbit. In skull L.1 the superior facial index is 47.54, being in the *euryen* group (low faced) and in L.5 it is in the *mesen* group, the index being 53.04. The skull L.1 has lesser superior facial height and greater bizygomatic breadth than L.5. The total facial height of the skull L.5 is 86.26% of the bizygomatic breadth and its total facial index falls in *mesoprosop* class.

It is interesting to note that the skull L.1 is *brachyuranic* and *brachytaphyline* in its maxillo-alveolar and palatal indices respectively, whereas in L.5 these are *dolichuranic* and *leptostaphyline* respectively.

### WEIGHT OF THE SKULLS

The skulls have been weighed with the help of a Cenco's Trip Balance (U.S.A.). Weight of L.1 is 443 gms and that of L.5 is 402.20 gms inclusive of the weight of missing teeth. In taking weight of the skull L.5, which has its right parietal partially broken, a similar piece from another broken Onge skull has been weighed along with it. For the weight of the missing teeth Martin Saller's (1956) method was followed. 52301

### FACIAL PROJECTION IN AN ANTERO-POSTERIOR PLANE

Applying Keith's method (1929), Fig. 1 and Fig. 2 show the measurements of facial projections from a vertical plane passing through the centre of the external auditory meatus at right angles to the Frankfurt Horizontal. (Table 4).

When we compare the facial projections of the two skulls in order to find out their differences, it is interesting to note that in four characters the two skulls coincide, viz. (i) projection of the nose (Column C) (ii) projection of the ascending nasal process of maxilla (Column D) (iii) projection of the lateral nasal margin (Column E) and (iv) projection of the nasion (Column F). Column G, which gives the projection of the glabella or the length of the preauricular part of the skull, shows that the skull L.1 exceeds the skull L.5 by 3.5 mm. In L.1 the glabella projects slightly (1.5 mm) beyond the nasal root, whereas in L.5 reverse is the case (2 mm). The nasal roots are, therefore, not depressed in either skull.

So far projection of the cheek bone is concerned, which is measured by Column B, both the skulls show the projection of 0.5 mm in front of the lateral margins of the orbits. This characteristic feature of the forward position of the cheek bones from the lateral orbital margin recalls Mongolian trait.

In Column E, are given the measurements of the projection of the least advanced part of the nose from mid-meatal point and its difference with the projection of malo-maxillary point is 21.5 mm and 18.5 mm for L.1 and L.5 respectively.

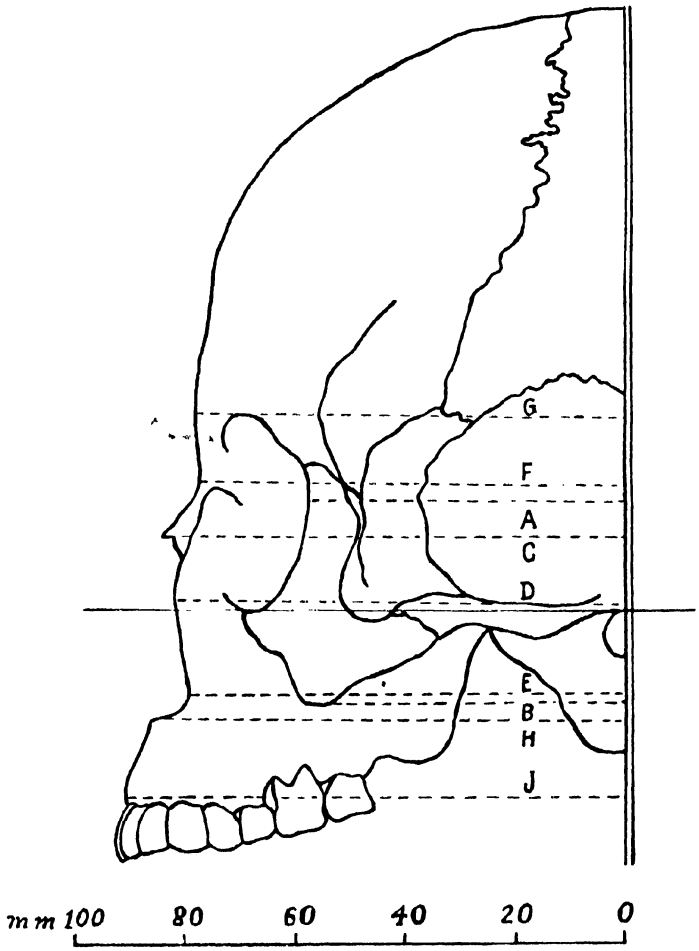


Fig. 1

Onge female (Skull L. 1).
Facial measurements in an Antero-Posterior Plane.

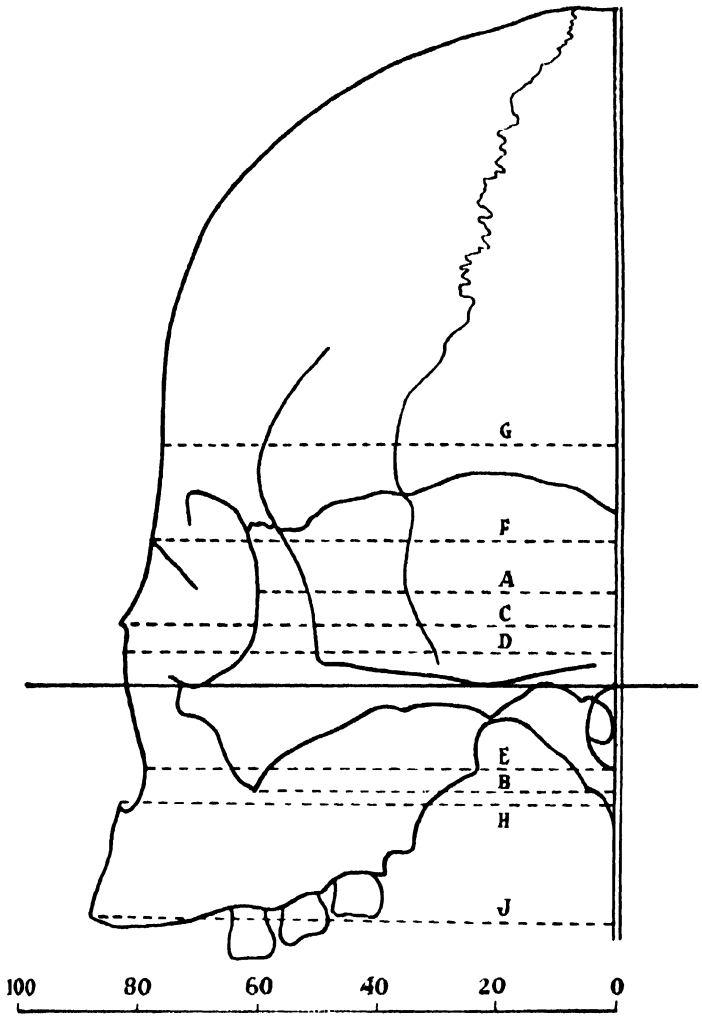


Fig. 2

Onge Female (Skull L.5).
Facial measurements in an Antero-Posterior Plane.

The nasal projection in front of the lateral wall of the orbit is 26 mm for L.1 and 23 mm for L.5, which, according to Keith (1929), is 21.5 mm among the Chinese.

## CONTOUR TRACINGS

Craniogram contours of both the skulls have been drawn by diagraph technique on three sagittal sections, viz. (i) Mid-Sagittal ( ——————— ), (ii) Mid-Orbital Sagittal (— . — . — . — . — . —), and (iii) Ecto-Conchion Sagittal (.....)

Dioptographic contour tracings on Normae Verticalis, Frontalis, Lateralis and Occipitalis (Plates I to IV) have been drawn on the two skulls.

A complete list of all measurements and indices is appended in Tables 1-23.

## EXTREMITY AND OTHER BONES

In general, the skeletons are small, slender and gracile. Measurements and indices of the long bones appear in tables 14 to 23. Ried's Osteometric board was largely used for their measurements.

*Clavicle*: These are comparatively short in length as appears from table 14. Caliber index of right L.1

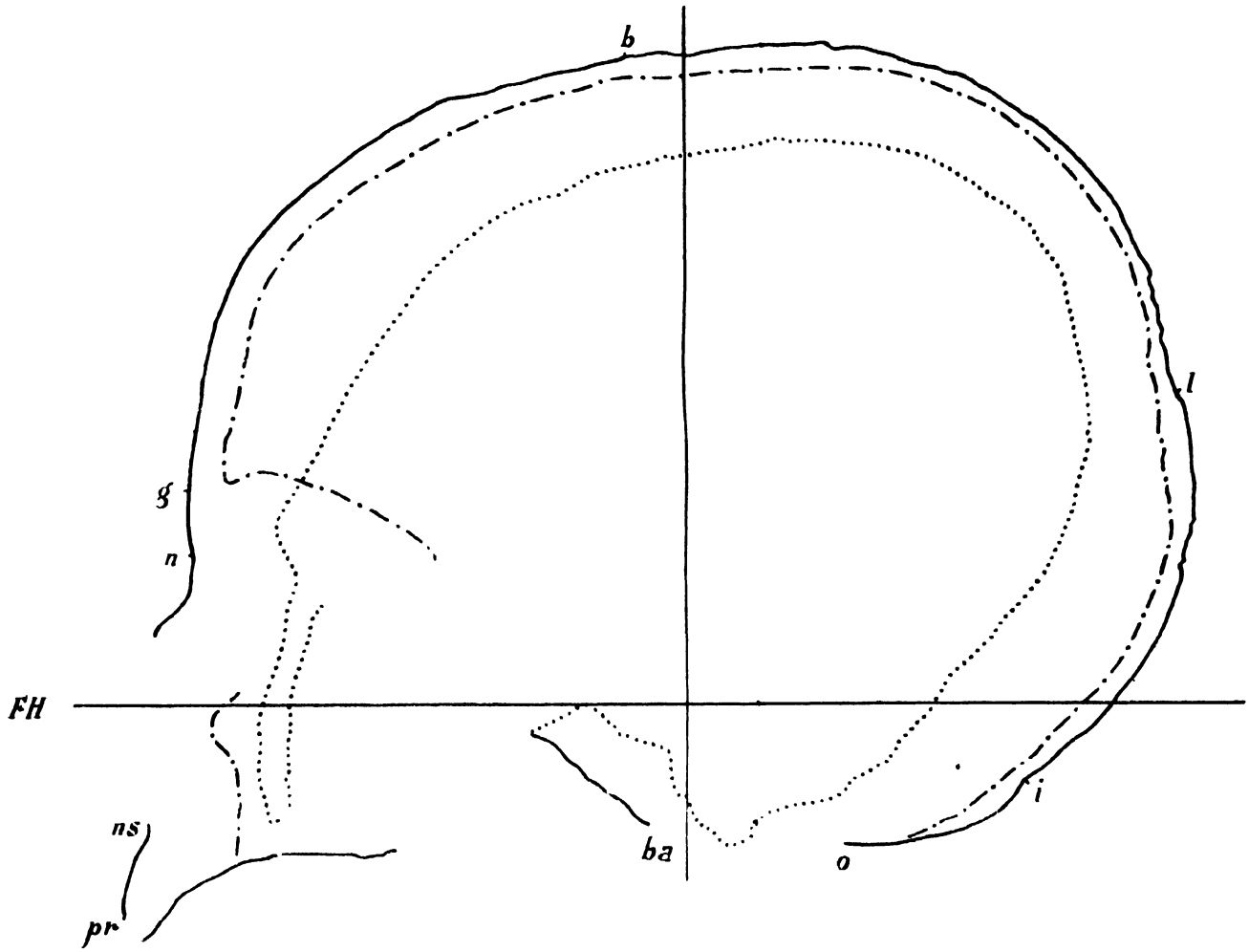


Fig. 3

Sagittal Curve of Onge Female Skull L.1 × .893 natural size

Mid - Sagittal Section ————

Mid - Orbital Sagittal Section-- .

Ecto-Conchion Sagittal Section .

is 24.32 and that of right and left L.5 is 25.12 and 23.53 respectively

*Scapula* : Although these are in broken condition, it appears that they are small in size. Scapular index of the left scapula of L.1 only could be worked out, which gives a high value of 76.70 indicating a primitive character. Suprasternal notch is shallow in three scapulae (in right L.5 this part is broken). Glenoid index is 68.97 in L.1 and 62.96 in L.5.

*Humerus* : These are slender bones. Muscular ridges are ill-marked. The humero-radial index of left L.5 could be calculated which is 83.20 or *dolichokerkic*. The caliber index is 17.05 (right) in L.1 and 17.51 (right) and 16.80 (left) in L.5.

*Radius* : Only in skeleton L.5 radii are present. The sagittal diameter of the shaft is 90% of the transverse diameter in the case of right radius and 85.71% in the case of the left.

*Ulna* : Only the right ulna of L.5 could be measured which shows a caliber index of 11.83.

*Pelvis* : The pelvic girdles are not delicate and the middle of the iliac fossa is not pellucid, specially in

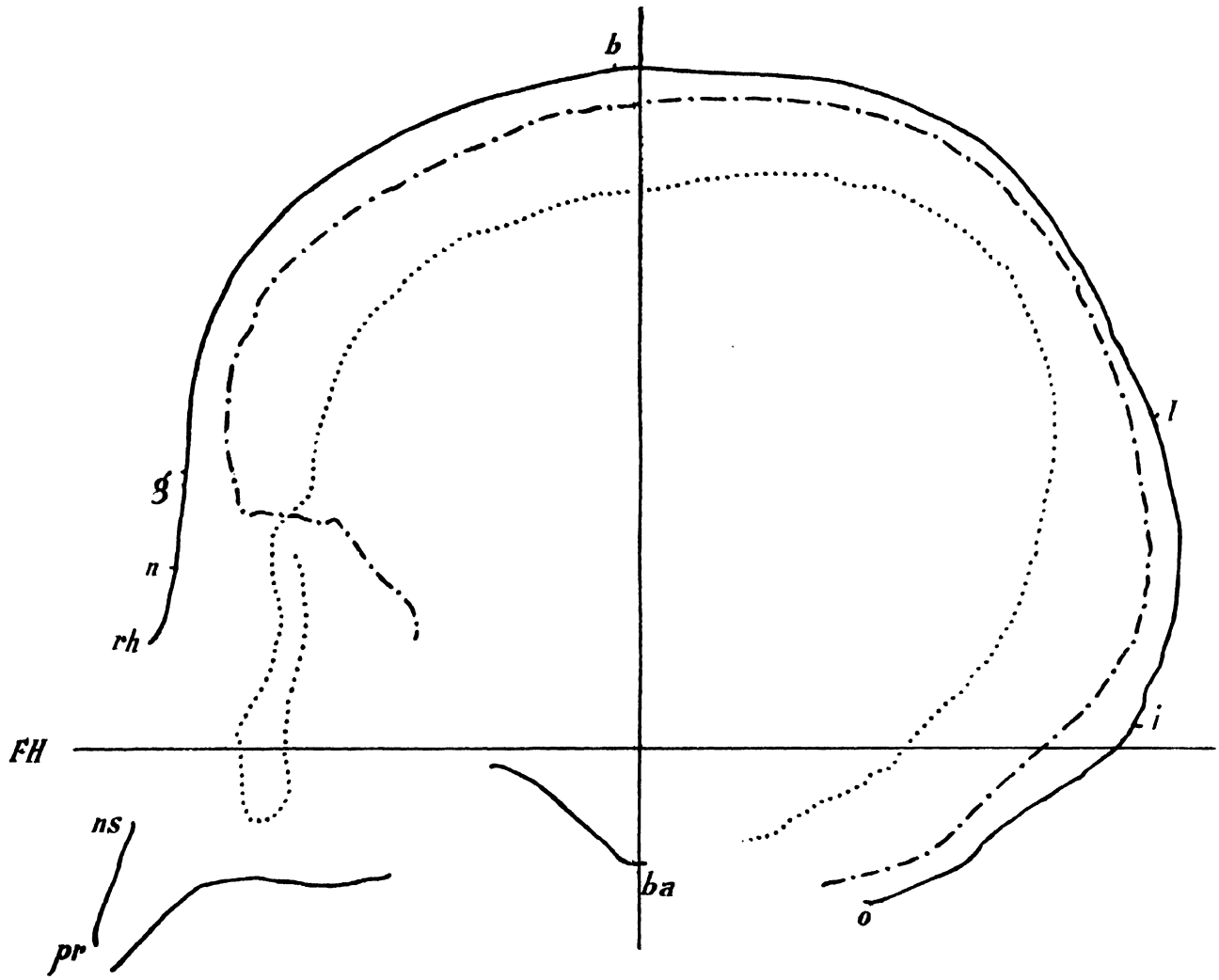


Fig. 4

**Sagittal Curve of Onge Female Skull L.5 × .913 natural size**

**Mid - Sagittal Section** ————————

**Mid - Orbital Sagittal Section** — . — . — .

**Ecto-Conchion Sagittal Section** . . . . . .

L.1. Pelves are narrow. The pelvic brim index of L.5 is 97.20 or *dolichopellic.*

*Femur*: The femora are comparatively better preserved except the left one of L.1. The inequalities in opposite femora of L.5 is slight except in torsion angle which shows a difference of 11°. These femora are moderately *platymeric,* and the right one of L.5 is more nearly *eurymeric.* Lengthdiameter index gives a value of 11.76 in right L.1 and 11.45 and 11.32 in right and left L.5. Pilastric index is higher in L.5 than in L.1.

*Tibia*: All the four tibiae are more or less in good condition. Cnemic index of tibia shows that the right tibia of L.1 and left tibia of L.5 are *platycnemic* whereas the left tibia of L.1 and right tibia of L.5 are *mesocnemic.* The femoro-tibial index indicates that all the four limbs are *dolichocnemic.*

*Fibula*: The right fibula of L.5 is comparatively better preserved which is 321 mm in absolute length The caliber index of this bone is 8.10.

Intermembral index of relative length of upper

and lower limbs could be calculated only on L.5, gives a value of 65.48, which is very low.

*Vertebra*: Measurements were taken and indices were calculated in the last four dorsal vertebrae and the five lumbar vertebrae according to the method of Turner (1886). It is apparent from Table 23 that as regards the lower dorsal vertebrae in both the skeletons the vertical diameter of the bodies posteriorly collectively exceeds the anterior vertical diameter. On the other hand, in the case of lumbar vertebrae, the anterior vertical diameter collectively exceeds the posterior vertical diameter by 6.5 mm in L.1 and by 2 mm in L.5. The values of general lumbar index of skeletons L.1 and L.5 fall in *kurtorhachic* class or convex spine and *orthorhachic* or straight spine respectively.

The authors are grateful to Dr S. S. Sarkar for his instructions during the preparation of the paper.

The authors are thankful to Shri R. C. Dey, Head Artist, Department of Anthropology for the pains he has taken for the stippling of the aforementioned dioptograph tracings.

**SUMMARY**

*The importance of the study of the Onge skeletons need not be emphasised strongly, considering the ethnic homogeneity of the isolated negrito population of Little Andaman. There is no previous record of any osteological study of this little known tribe, although the neighbouring Andamanese with whom they possess affinity, have been investigated.*

*Two adult female skeletons, which form a part of the collection of the Department of Anthropology, Government of India, have been described in this paper. The external morphology of the two skulls shows a general uniformity in shape, size and contour. The skulls are microcephal, brachycranial (one is hyper-), hypsicranial, with high orbits, low and broad face, prominent cheek bones, broad, flat nasal root with small nasal bones and rudimentary mastoids. Among other peculiarities, the most noteworthy feature at the base of the skull, which does not show much complication, is the mandibular articulation. Big Glenoid cavity provides evidences for side-to-side motion in mastication, and the Glaserian fissure (petrotympanic fissure) is prominent with two distinct lips as well as the tympanic plate is broad with sharp margin. Attrition of teeth indicates rough food habit. Incisors are shovel-shaped. In one skull 3rd molars did not erupt. Long bones which are small and slender show some indications of primitiveness.*

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# TABLES

**(All linear and curvilinear measurements are in millimetre.)**

## Cranial Measurements

| Skull No.: / Sex : | L. 1 | L. 5 |
|---|---|---|
| | Female | |
| Maximum cranial length | 160.0 | 162.0 |
| Maximum cranial breadth | 133.0 | 138.0 |
| Nasion inion length | 137.0 | 156.0 |
| Basilo-bregmatic height | 122.5 | 126.5 |
| Auricular height | 104.5 | 105 0 |
| Least frontal breadth | 91.0 | 86.0 |
| Greatest frontal breadth | 107.0 | 109.5 |
| Greatest occipital breadth | 93.0 | 98.0 |
| Sagittal cranial arc | 312.0 | 339.0 |
| Transverse cranial arc | 292.0 | 288.0 |
| Horizontal circumference | 469.0 | 466.0 |
| Frontal arc | 120.0 | 120.0 |
| Parietal arc | 120.0 | 115.0 |
| Occipital arc | 102.0 | 104.0 |
| Frontal chord | 105.5 | 107.0 |
| Parietal chord | 103.5 | 102.5 |
| Occipital chord | 90.0 | 90.0 |
| Glabella nasion length | 12.0 | 13.5 |
| Nasion lambda length | 159.0 | 159.0 |
| Bi auricular breadth | 106.5 | 107.0 |
| Bi mastoid breadth | 87.5 | 90.0 |

TABLE 1

## Facial Measurements

| Skull No.: / Sex : | L. 1 | L. 5 |
|---|---|---|
| | Female | |
| Nasion basion line | 83.0 | 89.0 |
| Nasion prosthion line | 58 0 | 61.0 |
| Prosthion basion line | 85.0 | 90.0 |
| Bizygomatic breadth | 122.0 | 115.0 |
| Nasal height | 41.0 | 41.5 |
| Nasal breadth | 24.0 | 24.0 |
| Inter orbital breadth | 20 0 | 19.0 |
| Orbital breadth | | |
| Right | 38.0 | 39.5 |
| Left | 38.5 | 40.0 |
| Orbital height | | |
| Right | 33.0 | 33.5 |
| Left | 33 0 | 32.5 |
| Bi orbital breadth | 88.0 | 90.5 |
| Maxillo alveolar length | 45.5 | 51.0 |
| Maxillo alveolar breadth | 54.5 | 55.0 |
| Palatal length | 35.0 | 43.0 |
| Palatal breadth | 33.5 | 31.0 |
| Occipital foramen | | |
| Length | 31.0 | 33.5 |
| Breadth | 23.0 | 29.0 |
| Outer bi-orbital breadth | 98.0 | 93.0 |
| Inner bi-orbital breadth | 91.5 | 88.0 |
| Bi orbitonasal arc | 96.0 | 93.0 |

| Skull No.: / Sex : | | L. 1 | L. 5 |
|---|---|---|---|
| | | Female | |
| **First molar (maxillary)** | | | |
| Right | Medio-distal diam.* | 9.5 | 11.0 |
| | Labio lingual diam.† | 11.0 | 11.5 |
| Left | Medio-distal diam. | 9.0 | 10.0 |
| | Labio-lingual diam. | 11.0 | 11.5 |
| **Second molar (maxillary)** | | | |
| Right | Medio-distal diam. | 9.5 | 10.0 |
| | Labio-lingual diam. | 11.0 | 11.5 |
| Left | Medio-distal diam. | 9.0 | 9.5 |
| | Labio-lingual diam. | 10.5 | 11.0 |
| **Third molar (maxillary)** | | | |
| Right | Medio-distal diam. | — | 8.0 |
| | Labio-lingual diam. | — | 9.5 |
| Left | Medio distal diam. | — | 9.0 |
| | Labio lingual diam. | — | 10.0 |

* Measured between the points or areas of interdental contact.
† Measured at right angles to the medio-distal diameter.

TABLE 2

## Measurements of the Nasal bone and Nasal aperture

| Skull No.: / Sex : | | L. 1 | L. 5 |
|---|---|---|---|
| | | Female | |
| Nasal bones (length) | ... | 13.0 | 16.0 |
| Nasal bones (breadth) | | | |
| Top | ... | 6.0 | 7.0 |
| Waist | ... | 5.0 | 5.0 |
| Bottom | ... | 7.0 | 8.0 |
| Nasal aperture | | | |
| Breadth | ... | 24.0 | 24 0 |
| Height | ... | 32.0 | 29.0 |

TABLE 3

## Measurements of the Face in the Anteroposterior Plane

| Skull No.: / Sex : | | L. 1 | L. 5 |
|---|---|---|---|
| | | Female | |
| A. Projection of the lateral orbital margin before mid-auricular plane | | 57.0 | 59.0 |
| B. Projection of the malo-maxillary point | ... | 57.5 | 60.0 |
| C. Projection of the nose | ... | 83.0 | 60.0 |
| D. Projection of the ascending nasal process of maxilla | ... | 82.0 | 82.0 |
| E. Projection of the lateral nasal margin | ... | 79.0 | 78.5 |
| F. Projection of the nasion | ... | 77.0 | 77.0 |
| G. Projection of the pre-auricular | ... | 78.5 | 75.0 |
| H Projection of the subnasal point | ... | 86.5 | 82.5 |
| J. Projection of the upper alveolar point | ... | 91.0 | 88.0 |

TABLE 4

### Indices of the Cranium

| Skull No.: | L. 1 | L. 5 |
|---|---|---|
| Sex : | Female | |
| Length-breadth index | 83.13 | 85.19 |
| Length-height index | 76.56 | 78.09 |
| Length-auricular height index | 65.31 | 64.81 |
| Breadth-height index | 92.11 | 91.67 |
| Breadth-auricular height index | 78.07 | 79.09 |
| Calvarial height index | 77.14 | 81.54 |
| Bregma position index | 32.85 | 37.18 |
| Sagittal cranial curvature index | 41.06 | 46.02 |
| Transverse cranial curvature index | 36.47 | 37.15 |
| Transverse fronto-parietal index | 68.42 | 62.32 |

TABLE 5.

### Indices of the Face

| Skull No.: | L. 1 | L. 5 |
|---|---|---|
| Sex : | Female | |
| Superior facial index | 47.54 | 53.04 |
| Zygomatico-frontal index | 74.59 | 74.78 |
| Zygomatico-mandibular index | — | 75.65 |
| Inter-orbital index | 22.73 | 20.99 |
| Orbital index | | |
| Right | 86.84 | 84.81 |
| Left | 85.71 | 81.25 |
| Nasal index | 54.55 | 57.83 |
| Palatal index | 95.71 | 71.09 |
| Maxillo-alveolar index | 19.78 | 107.84 |

TABLE 6.

### Indices showing the relation of various Sagittal Arcs

| Skull No.: | L. 1 | L. 5 |
|---|---|---|
| Sex : | Female | |
| Fronto-parietal index | 100.00 | 95.83 |
| Fronto-occipital index | 85.00 | 86.67 |
| Parieto-occipital index | 85.00 | 90.43 |
| Fronto-sagittal arc index | 35.09 | 35.40 |
| Parieto-sagittal arc index | 35.09 | 33.92 |
| Occipito-sagittal arc index | 29.82 | 30.68 |

TABLE 7.

### Indices showing the amount of Curvature (bulging) of each of the three Contour bones of the Cranium

| Skull No.: | L. 1 | L. 5 |
|---|---|---|
| Sex : | Female | |
| Frontal curvature index | 87.08 | 89.17 |
| Parietal curvature index | 86.25 | 89.13 |
| Occipital curvature index | 88.21 | 86.54 |

TABLE 8.

### Indices showing relations between Cranium and Face

| Skull No.: | L. 1 | L. 5 |
|---|---|---|
| Sex : | Female | |
| Longitudinal cranio facial index | 53.13 | 55.56 |
| Transverse cranio-facial index | 91.73 | 83.33 |
| Vertical cranio facial index | 17.35 | 18.25 |

TABLE 9.

### Some Additional Indices

| Skull No.: | L. 1 | L. 5 |
|---|---|---|
| Sex : | Female | |
| Lambda calvarial height index | 66.56 | 69.63 |
| Frontal perpendicular index | 23.92 | 21.30 |
| Parietal perpendicular index | 25.12 | 22.93 |
| Occipital perpendicular index | 21.11 | 26.11 |

TABLE 10.

### Measurements of the Mandible

| Mandible No.: | | L. 5 |
|---|---|---|
| Sex : | | Female |
| Bigonial breadth | | 37.0 |
| Minimum breadth of the | | 30.0 (Lt side) |
| Symphyseal height | | 20.0 |
| Mandibular length | | 78.5 |
| First molar (mandibular) | | |
| Right | Medio distal diam. | 10.0 |
| | Labio lingual diam. | 10.0 |
| Left | Medio-distal diam | 11.0 |
| | Labio lingual diam. | 10.5 |
| Second molar (mandibular) | | |
| Right | Medio distal diam. | 10.0 |
| | Labio lingual diam | 10.0 |
| Left | Medio-distal diam. | 10.5 |
| | Labio lingual diam. | 10.0 |

TABLE 11.

### Measurements on the Median Cranlogram

| Skull No.: | L. 1 | L. 5 |
|---|---|---|
| Sex : | Female | |
| Calvarial height | 106.5 | 96.0 |
| Lambda calvarial height | 66.5 | 69.0 |
| Bregma position line | 94.0 | 90.5 |
| Frontal perpendicular | 25.0 | 36.0 |
| Parietal perpendicular | 26.0 | 23.5 |
| Occipital perpendicular | 22.0 | 23.5 |
| Nasion to foot of bregma perpendicular | 45.0 | 58.0 |

TABLE 12.

### Angular measurements on the Mid-Sagittal Craniogram

| Skull No.: | L. 1 | L. 5 |
|---|---|---|
| Sex : | Female | |
| Frontal inclination angle | 64.5° | 57.5° |
| Occipital inclination angle | 95.5° | 85.0° |
| Facial profile angle | 78.0° | 76.5° |
| Calvarial base angle | 16.0° | 10.0° |
| Frontal curvature angle | 127.5° | 128.5° |
| Parietal curvature angle | 127.0° | 130.5° |
| Occipital curvature angle | 127.0° | 123.5° |
| Occipital flexion angle | 131.5° | 126.0° |
| Superior facial length angle | 39.5° | 10.0° |
| Alveolar profile angle | 71.5° | 70.5° |
| Prosthion-nasion-basion angle | 70.0° | 71.0° |

TABLE 13.

### Measurements and indices of Clavicle

| Skeleton No.: | L. 1 | | L. 5 | |
|---|---|---|---|---|
| Sex : | Female | | | |
| | Rt. | Lt. | Rt. | Lt. |
| Maximum length | 1 1.0 | — | 107.5 | 110.5 |
| Girth | 27.0 | 25.0 | 27.0 | 26.0 |
| Vertical diam. at the middle | 7.0 | 7.0 | 7.0 | 7.5 |
| Sagittal diam. at the middle | 9.5 | 9.0 | 9.0 | 9.0 |
| The two angles of curvature | | | | |
| **Indices** | | | | |
| Caliber index | 24.32 | | 25.12 | 23.53 |
| Clavicle-humeral index | 42.05 | | 41.83 | 43.16 |

TABLE 14.

### Measurements and Indices of Scapula

| Skeleton No.: | L. 1 | | L. 5 |
|---|---|---|---|
| Sex : | Female | | |
| | Rt. | Lt. | Lt. |
| Morphological length (max. br.) | 83.5 ? | 79.0 ? | 82.0 |
| Morphological breadth (max. length) | — | 103 0 | — |
| Spinal axis | 80.0 ? | 80.0 | 79.0 |
| Length of the supra spinous line | 39.0 ? | 35.0 ? | — |
| Length of the infra-spinous line | — | 74.0 ? | 78.0 ? |
| Ant. post. diameter of the glenoid fossa (vert.) | 29.0 | 29.0 | 27.0 |
| Dorso-ventral diam. of the glenoid fossa (trans.) | 20.0 | 20.0 | 17.0 |
| Length of the axillary border | — | 98.0 | 97.0 ? |
| **Indices** | | | |
| Scapular index | — | 76.70 ? | — |
| Supra-spinous index | — | 33.98 | — |
| Infra-spinous index | — | 71.84 | — |
| Axillary index | — | 95.15 | — |
| Fossorial index | — | 47.30 | — |
| Glenoid index | 68.97 | 68.97 | 62.96 |

TABLE 15.

### Measurements and Indices of Humerus

| Skeleton No.: | L. 1 | | L. 5 | |
|---|---|---|---|---|
| Sex : | Female | | | |
| | Rt. | Lt. | Rt. | Lt. |
| Maximum length | 264.0 | — | 257.0 | 256.0 |
| Breadth of the proximal epiphysis | 40.0 | — | 38.0 | 38.0 |
| Breadth of the distal epiphysis | 48.0 | — | 42.0 | 47.0 |
| Longitudinal diam. of the head | 36.0 | — | 35.5 | 31.0 |
| Transverse diam. of the head | — | — | 33.0 | 32.0 |
| Circumference of the shaft at upper third | 49.0 | 48.0 | 45.0 | 45.0 |
| Least circumference of the shaft | 45.0 | 44.0 | 45.0 | 43.0 |
| Circumference of the head | — | — | 107.0 | 105.0 |
| **Angle** | | | | |
| Torsion angle | 40.0° | | 37.0° | 28.0° |
| **Indices** | | | | |
| Caliber index | 17.05 | | 17.51 | 16.80 |
| Index of the head | | | 92.96 | 94.12 |
| Humero-radial index | | | -- | 83.20 |

TABLE 16.

### Measurements and Indices of Radius

| Skeleton No.: | L. 5 | |
|---|---|---|
| Sex : | Female | |
| | Rt. | Lt. |
| Maximum length | — | 213.0 |
| Physiological length | — | 203.0 |
| Least circumference of the distal half | 30.0 | 30.0 |
| Sagittal diam. of the shaft | 9.0 | 9.0 |
| Transverse diam. of the shaft | 10.0 | 10.5 |
| **Indices** | | |
| Caliber index | — | 13.04 |
| Diaphyseal index | 90.00 | 85.71 |

TABLE 17.

### Measurements and Indices of Ulna

| Skeleton No.: | L. 1 | | L. 5 | |
|---|---|---|---|---|
| Sex : | F | | a | e |
| | Rt. | Lt. | Rt. | Lt. |
| Maximum length | | | 226.5 | |
| Physiological length | | | 221.0 | |
| Least circumference of the diaphysis | 29.0 | 28.0 | 25.0 | 25.0 |
| **Index** | | | | |
| Caliber index | | | 11.85 | — |

TABLE 18.

## Measurements and Indices of Pelvis

| Skeleton No.: | L. 1 | L. 5 |
|---|---|---|
| Sex : | Female | |
| **A External dimensions** | | |
| Height of the pelvis | 162.0 | 166.0 |
| Breadth of the pelvis (cristal br.) | 211.0 | 213.0 |
| Breadth between ant. sup. iliac spines | 202.0 | 184.0 |
| Vertical diam. of the acetabulum | 49.0 (Lt.) | 45.0 (Lt.) |
| Trans. diam. of the acetabulum | 45.0 (Lt.) | 41.0 (Lt.) |
| Height of the obturator foramen | 36.0 (Lt.) | 44.0 (Lt.) |
| Width of the obturator foramen | 24.0 (Lt.) | 29.0 (Lt.) |
| **Indices** | | |
| Breadth-height index | 76.78 | 78.93 |
| Obturator index | 66.67 | 65.91 |
| **B Dimensions of the cavity of the true Pelvis** | | |
| Trans. diameter of the brim | 117.0 | 107.0 |
| Conjugate diameter of the brim | — | 104.0 (?) |
| Oblique diameter: | | |
| Right | 129.0 | 109.0 |
| Left | 127.0 | 113.0 |
| Inferior sagittal diameter | — | 109.0 |
| **Indices** | | |
| Pelvic brim index | — | 97.20 |
| Index of pelvis outlet | — | 95.41 |
| **C Dimensions of individual bones** | | |
| Length of the ilium | 110.0 (Lt.) | 102.0 (Lt.) |
| Breadth of the ilium | 128.0 (Lt.) | 129.0 (Lt.) |
| Breadth of the innominate bone | — | 143.0 (Lt.) |
| Length of the ischium | 54.0 (Lt.) | 56.0 (Lt.) |
| **Indices** | | |
| Iliac index | 116.36 | 126.47 |
| Ischiadic index | 33.33 | 33.73 |

TABLE 19.

## Measurements and Indices of Femur

| Skeleton No.: | L. 1 | | L. 5 | |
|---|---|---|---|---|
| Sex : | Female | | | |
| | Rt. | Lt. | Rt. | Lt. |
| **A Length** | | | | |
| Absolute length | 377.0 | — | 386.0 | 385.0 |
| Physiological length | 370.0 | — | 380.0 | 380.0 |
| Trochanter length in natural position | 384.0 | — | 364.0 | — |
| Length of femur shaft | 298.0 | 302.0 | 317.0 | 319.0 |
| **B Shaft** | | | | |
| Prox. dorso ventral diameter | 18.5 | 18.0 | 18.0 | 17.5 |
| Prox. medio-lateral diameter | 24.0 | 23.0 | 22.0 | 22.5 |
| Medial dorso-ventral diameter | 22.0 | 21.0 | 23.0 | 23.0 |
| Medial medio-lateral diameter | 21.5 | 21.0 | 20.5 | 20.0 |
| Circumference of shaft | 68.0 | 68.0 | 69.5 | 69.0 |
| **C Proximal end** | | | | |
| Oblique proximal length | 72.0 | — | 68.0 | 68.0 |
| Length of head and neck | 51.0 | — | 41.0 | 42.0 |
| Vertical diameter of head | 37.0 | — | 34.5 | 34.5 |
| Transverse diameter of head | 38.0 | — | 34.5 | 34.0 |
| Circumference of head | 118.0 | | 109.0 | 108.0 |
| Vertical diameter of neck | 28.0 | | 23.0 | 22.5 |
| Transverse diameter of neck | 21.0 | — | 18.0 | 18.0 |
| Circumference of neck | 83.0 | — | 72.0 | 71.0 |
| **D Distal end** | | | | |
| Dorso-ventral diameter of the shaft just above the condyles | 22.0 | 22.0 | 20.0 | 20.0 |
| Medio-lateral diameter of the shaft just above the condyles | 28.0 | 29.0 | 27.0 | 28.0 |
| Greatest medio-lateral breadth across the epi-condyles | — | — | 67.0 | 68.0 |
| Greatest dorso-ventral length of the medial condyles | 50.0 | 51.0 | 48.0 | 48.0 |
| Greatest dorso-ventral length of the condyle | 50.5 | 50.5 | 48.0 | 49.0 |
| **E Angle** | | | | |
| Torsion angle | 17.5° | — | 32.0° | 21.0° |
| **INDICES** | | | | |
| **A Caliber** | | | | |
| Length circumference index | 18.38 | — | 18.29 | 18.16 |
| Length diameter index | 11.76 | — | 11.45 | 11.32 |
| **B Shape** | | | | |
| Platymeric index | 77.08 | 78.26 | 81.82 | 77.78 |
| Pilastric index | 102.33 | 100.00 | 112.20 | 115.00 |
| Popliteal index | 78.57 | 75.86 | 74.07 | 71.43 |
| **C Proximal end** | | | | |
| Head index | 102.70 | — | 100.00 | 98.55 |
| Robusticity index | 20.27 | — | 18.16 | 18.03 |
| Neck length index | 13.78 | — | 10.79 | 11.05 |

TABLE 20.

## Measurements and Indices of Tibia

| Skeleton No.: | L. 1 | | L. 5 | |
|---|---|---|---|---|
| Sex : | F e m | | a l e | |
| | Rt. | Lt. | Rt. | Lt. |
| **Length** | | | | |
| Maximum length (spino-malleolar) | 321.0 | 320.0 | 335.0 | 336.0 |
| Maximum length (condylo-malleolar) | 310.0 | 311.0 | 325.0 | 325.0 |
| Physiological length shaft | 305.0 | 304.0 | 316.0 | 320.0 |
| Dorso-ventral diameter. (prox.) | 31.0 | 33.0 | 31.0 | 35.0 |
| Medio-lateral diameter (prox) | 24.0 | 22.0 | 26.5 | 24.0 |
| Dorso-ventral diameter (at the level of the nutrient foramen) | 25 0 | 25.5 | 26.0 | 24.0 |
| Medio-lateral diameter (at the level of the nutrient formen) | 18.0 | 17.0 | 18.0 | 17.0 |
| Dorso-ventral diameter (med.) | 22.5 | 23.0 | 23.0 | 21.0 |
| Medio-lateral diameter (med.) | 16.0 | 16.0 | 16.5 | 15.0 |
| Dorso-ventral diameter (dist.) | 19.0 | 19.0 | 19.5 | 16.5 |
| Medio-lateral diameter (dist.) | 21.0 | 20.0 | 20.0 | 21.0 |
| Circumference of shaft (med.) | 60.0 | 59.0 | 52.0 | 60.0 |
| Least circumference of shaft | 57.0 | 55.0 | 56.0 | 55.0 |
| Proximal epiphyseal breadth | — | — | 62.0 | 64.0 |
| Sagittal diameter of distal epiphysis | 30.0 | 30.0 | 30.0 | 30.0 |
| **Indices** | | | | |
| Cnemic Index | 72.00 | 66.67 | 69.23 | 70.83 |
| Caliber index | 17.76 | 17.19 | 16.72 | 16.37 |
| Femoro-tibial index | 85.15 | — | 86.79 | 87.27 |

TABLE 21.

## Measurements and Indices of Fibula

| Skeleton No.: | L. 1 | | L. 5 | |
|---|---|---|---|---|
| Sex : | F e m | | a l e | |
| | Rt. | Lt. | Rt. | Lt. |
| Absolute length | — | — | 321.0 | — |
| Circumference of the middle of shaft | 36.0 | 38.0 | 39.0 | 37.0 |
| Least circumference | 28.0 | 27.0 | 26.0 | 28.0 |
| **Index** | | | | |
| Caliber index | — | — | 8.10 | — |

TABLE 22.

## Measurements and Indices on Vertebrae

| Vertebrae | Ant. Vert. dia. | | Post. Vert. dia. | | Special Index | | General Index | |
|---|---|---|---|---|---|---|---|---|
| | L. 1 | L. 5 | L. 1 | L. 5 | L. 1 | L. 5 | L. 1 | L. 5 |
| 9th Dorsal Ver. | Broken | 17.0 | Broken | 17.5 | — | 102.94 | | |
| 10th .. .. | 18.5 | 18.0 | 20.0 | 19.0 | 108.11 | 105.56 | 106.72 | 106.76 |
| 11th .. .. | 20.0 | 18.0 | 21.5 | 21.0 | 107.50 | 116.67 | | |
| 12th .. .. | 21.0 | 21.0 | 22.0 | 21.5 | 104.76 | 102.38 | | |
| | 59.5 | 74.0 | 63.5 | 79.0 | | | | |
| 1st Lumbar Ver. | 21.5 | 21.5 | 23.0 | 20.5 | 106.98 | 95.35 | | |
| 2nd .. .. | 24.0 | 21.5 | 22.0 | 23.0 | 91.67 | 106.98 | 94.44 | 98.16 |
| 3rd .. .. | 23.5 | 22.0 | 23.0 | 22.0 | 97.87 | 100.00 | | |
| 4th .. .. | 24.0 | 22.0 | 22.0 | 22.5 | 91.67 | 102.27 | | |
| 5th .. .. | 24.0 | 21.5 | 20.5 | 18.5 | 85.42 | 86.05 | | |
| | 117.0 | 108.5 | 110.5 | 106.5 | | | | |

TABLE 23.

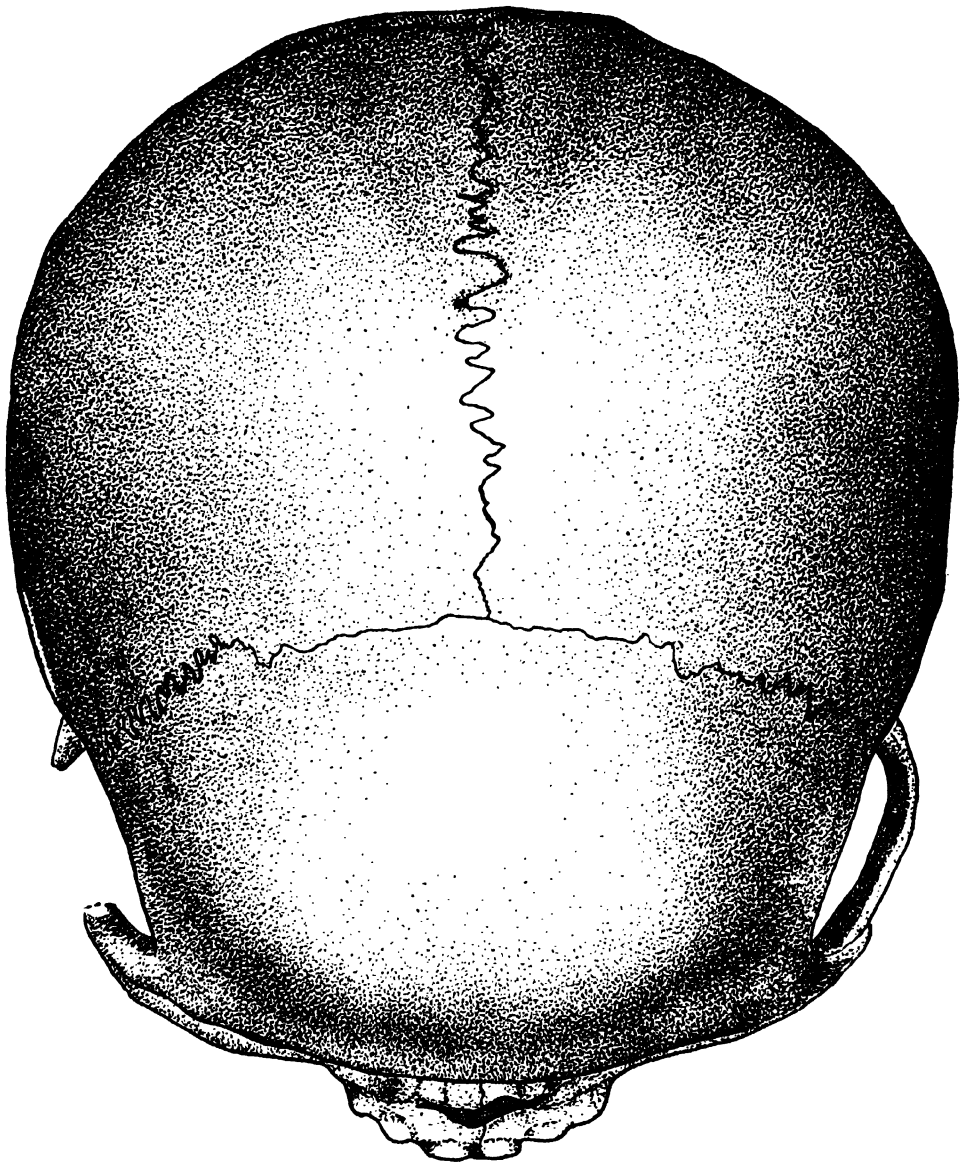

**Fig. 1.** *Norma Verticalis*

**DIOPTOGRAPH DRAWING (STIPPLED) : ONGE FEMALE (SKULL L.1)**

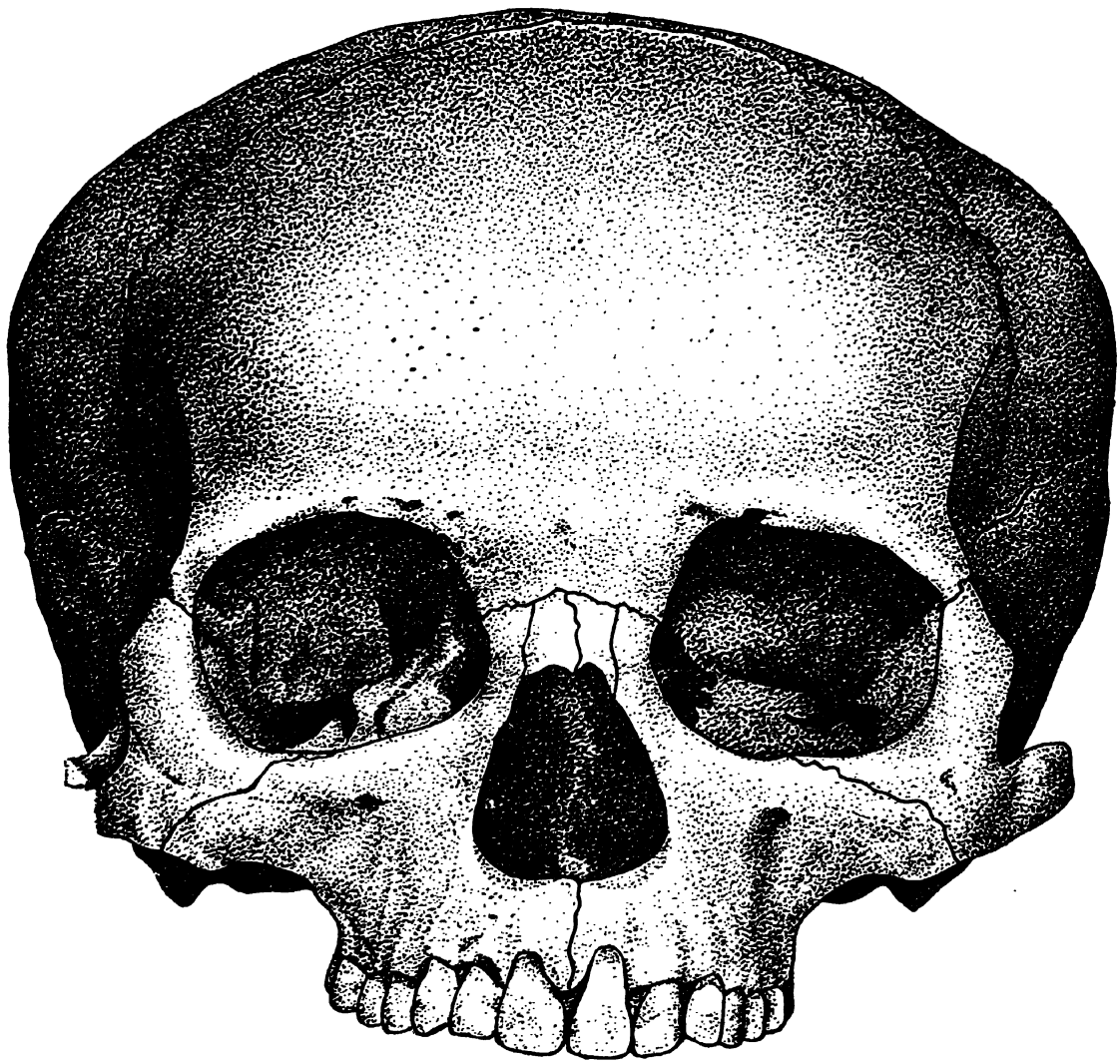

**Fig. 2.** *Norma Facialis*

**DIOPTOGRAPH DRAWING (STIPPLED) : ONGE FEMALE (SKULL L.1)**

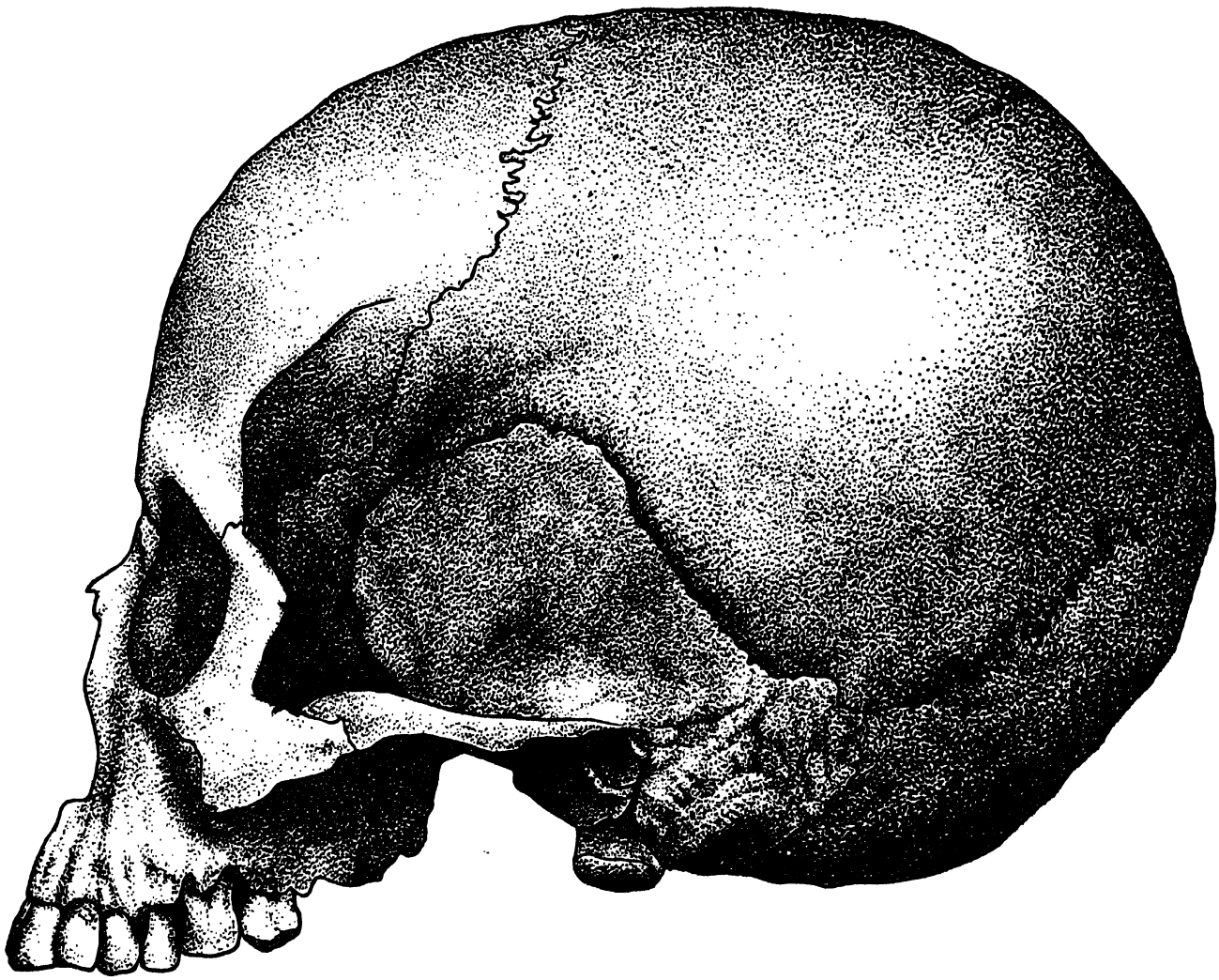

**Fig. 1.** *Norma Lateralis*

**DIOPTOGRAPH DRAWING (STIPPLED) : ONGE FEMALE (SKULL L.1)**

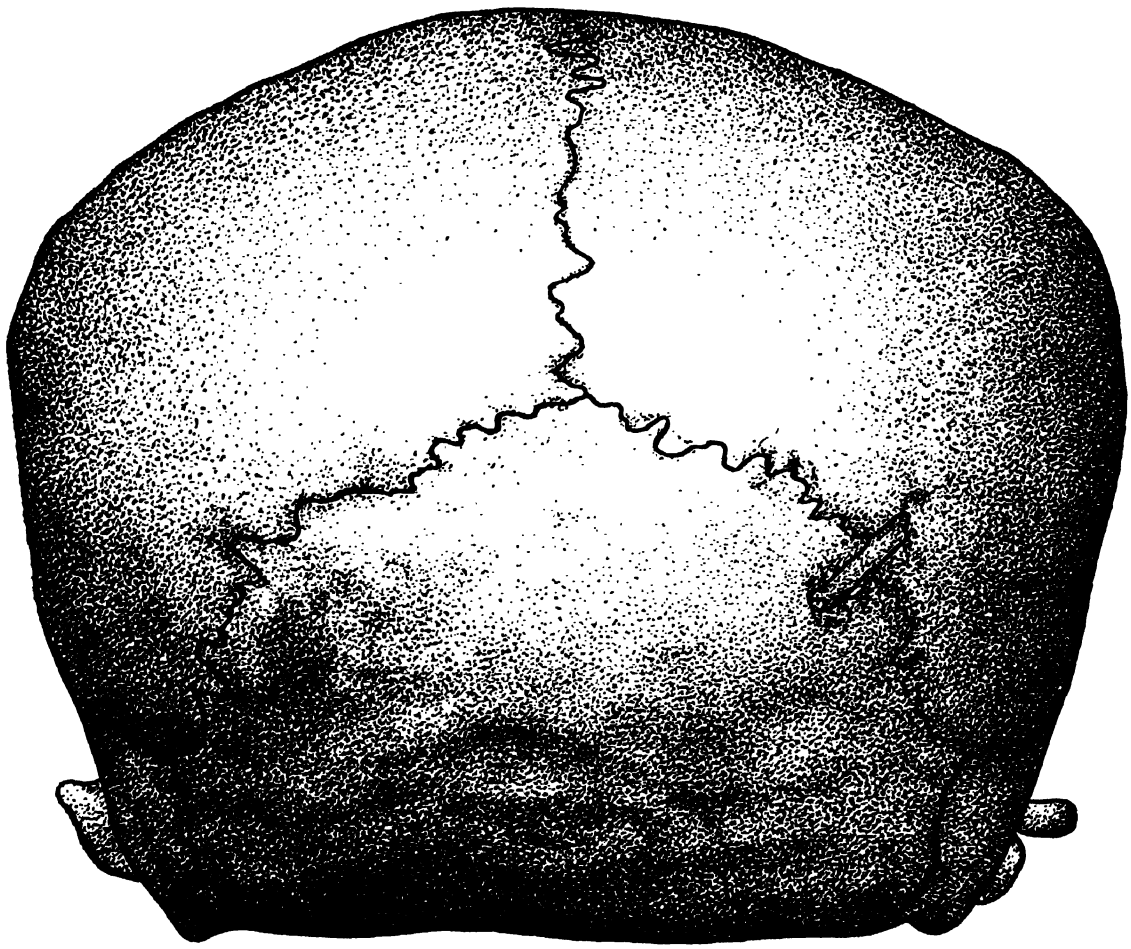

**Fig. 2.** *Norma Occipitalis*

**DIOPTOGRAPH DRAWING (STIPPLED) : ONGE FEMALE (SKULL L.1)**

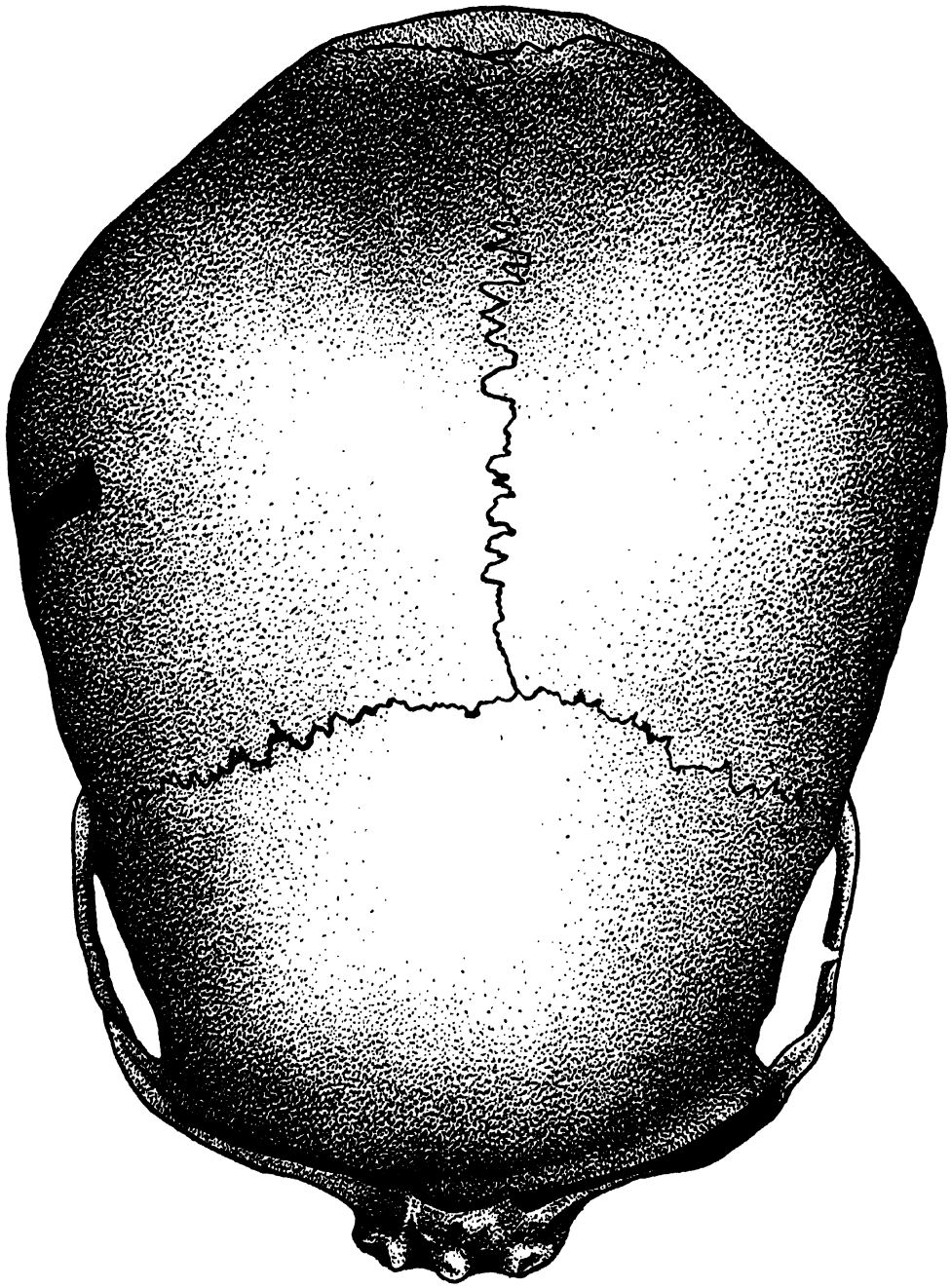

**Fig. 1.** *Norma Verticalis*

**DIOPTOGRAPH DRAWING (STIPPLED) : ONGE FEMALE (SKULL L.5)**

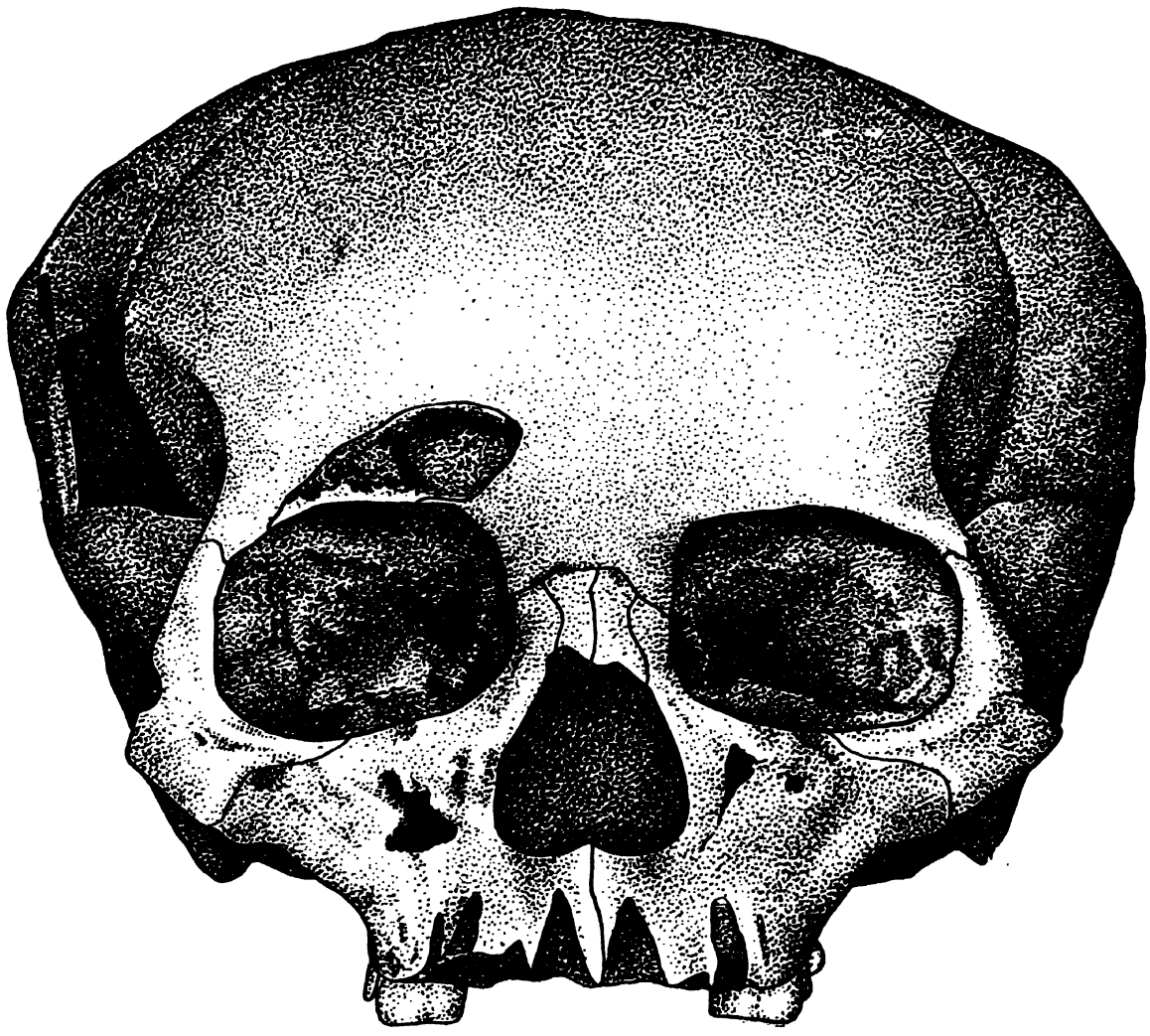

**Fig. 2.** *Norma Facialis*

**DIOPTOGRAPH DRAWING (STIPPLED) : ONGE FEMALE (SKULL L.5)**

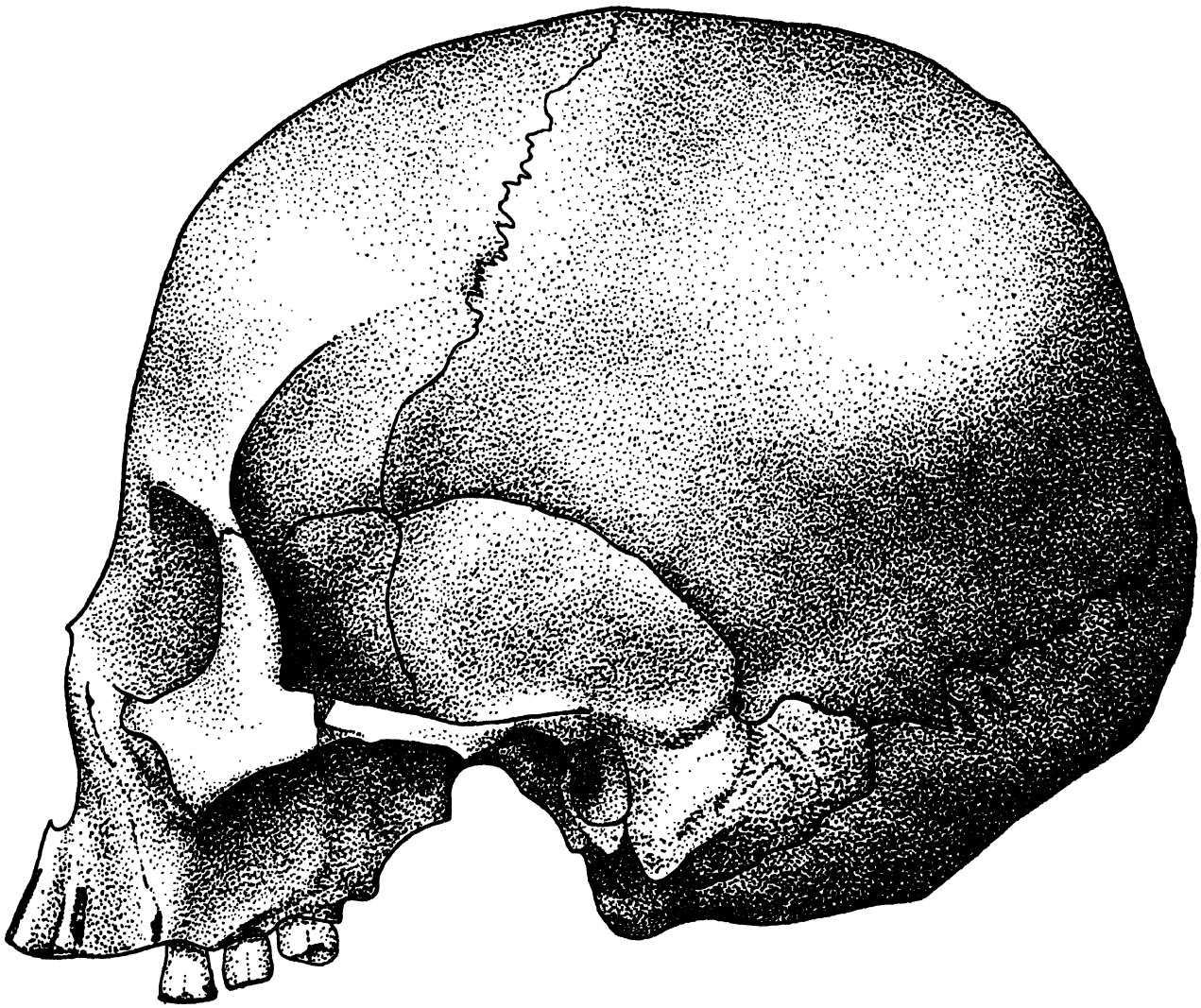

**Fig. 1.** *Norma Lateralis*

**DIOPTOGRAPH DRAWING (STIPPLED) : ONGE FEMALE (SKULL L.5)**

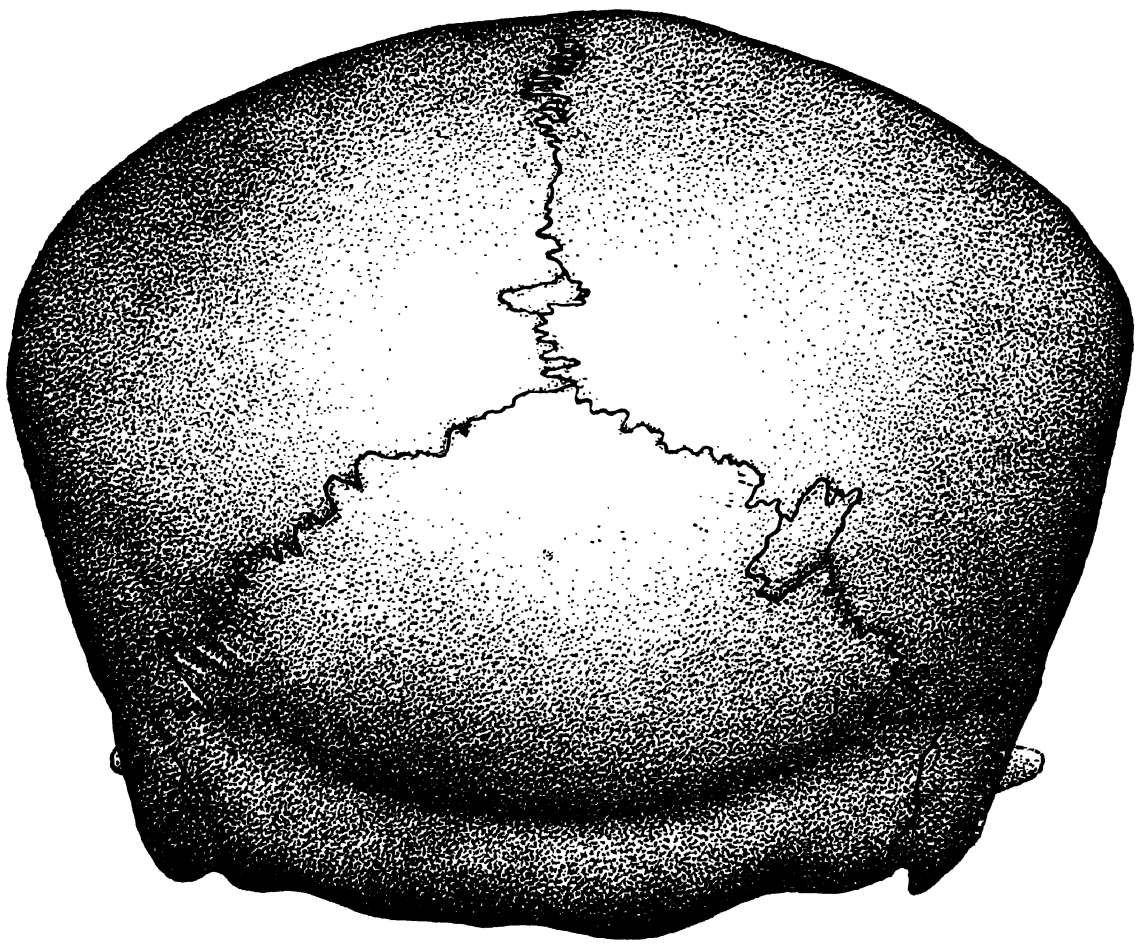

**Fig. 2.** *Norma Occipitalis*

**DIOPTOGRAPH DRAWING (STIPPLED) : ONGE FEMALE (SKULL L.5)**

**Fig. 1.** *Norma Basalis* (Skull L.1)

**PHOTOGRAPH : BASAL VIEW OF ONGE FEMALE**

**Fig. 2.** *Norma Basalis* (Skull L.5)

**PHOTOGRAPH : BASAL VIEW OF ONGE FEMALE**

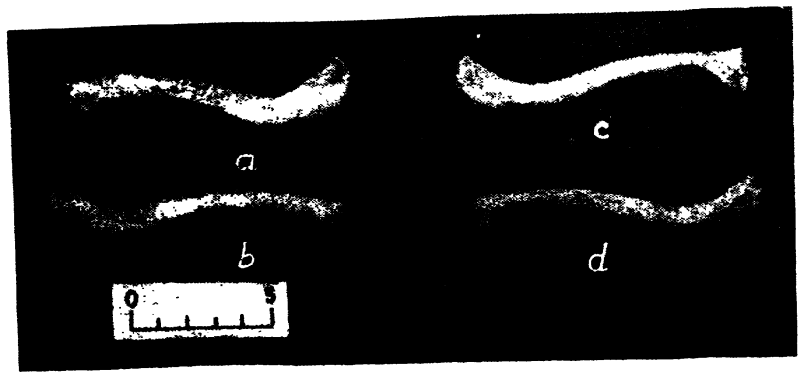


**Fig. 1.** a, cranial surface of right clavicle of L.1.
b, left clavicle of the same;
c, right, d, left clavicle of L.5, viewed on its caudal aspect.

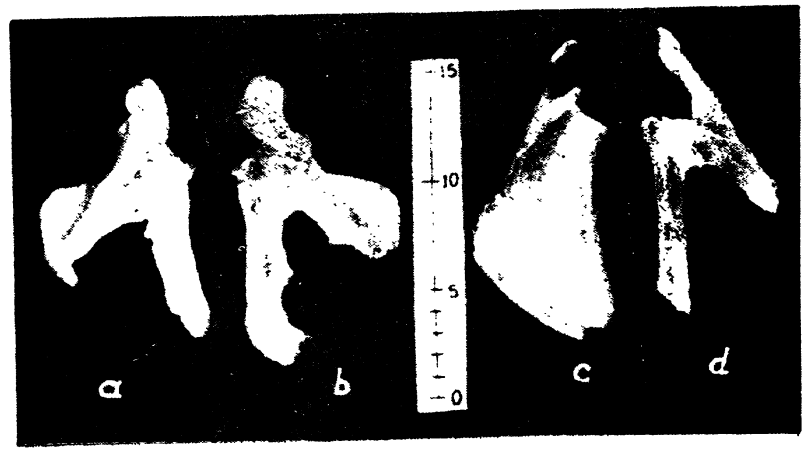


**Fig. 2.** a, dorsal aspect of right scapula of L.1.
b, left scapula of the same;
c, ventral aspect of left scapula of L.5;
d, right scapula of the same.

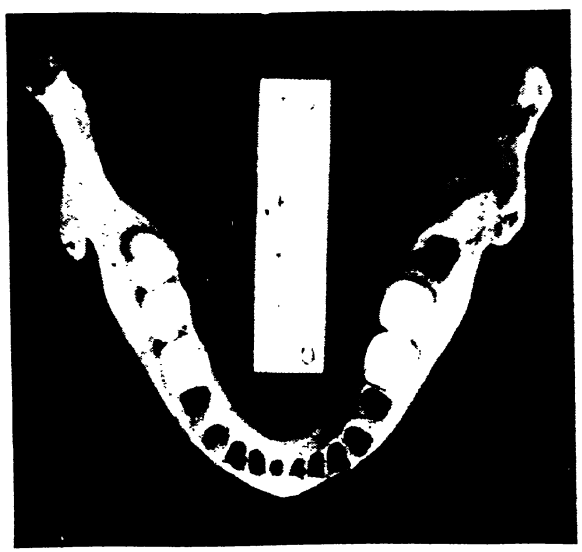

**Fig. 3.** Occlusal aspect of mandible L.5.

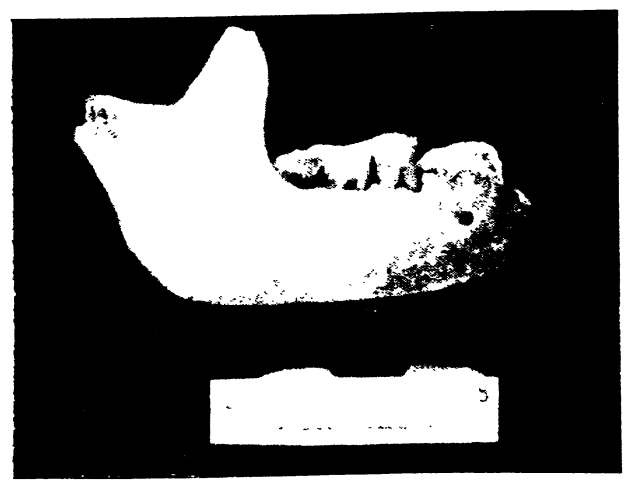

**Fig. 4.** Right lateral aspect of mandible L.5.

PHOTOGRAPHS : CLAVICLE, SCAPULA AND MANDIBLE

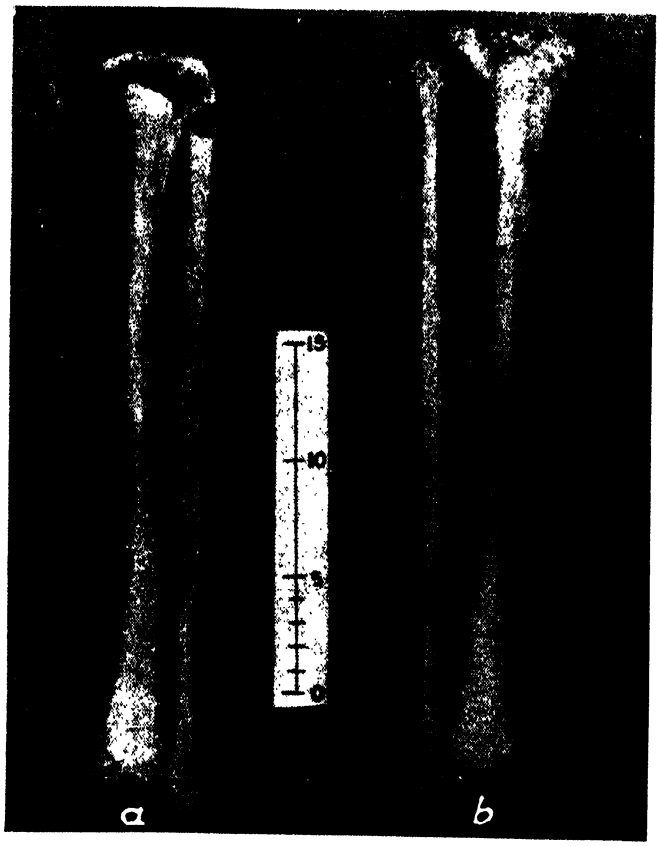


Fig. 1. Anterior view of tibia and fibula in articulation
a, right; b, left

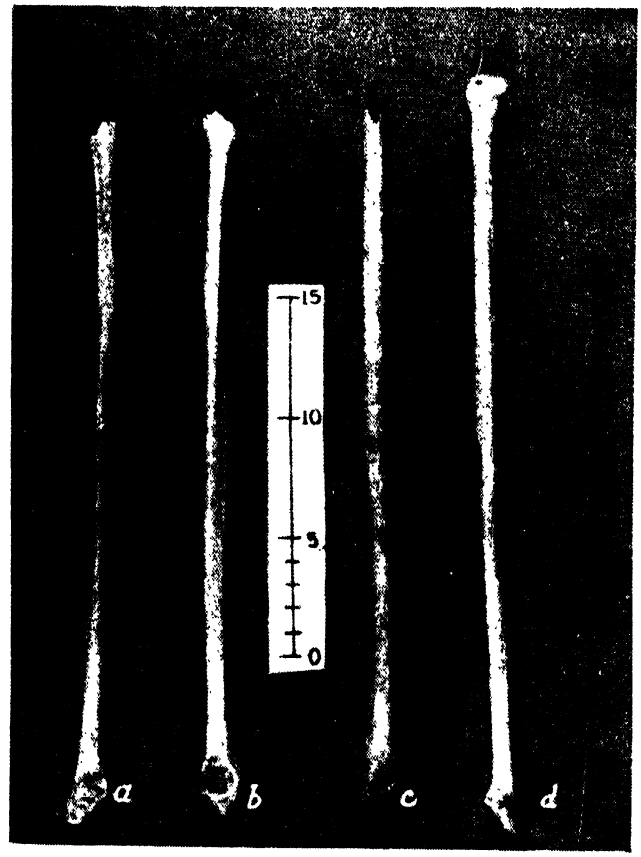


Fig. 2. a, b, lateral aspect of right and left fibula of L.1
c, d, lateral aspect of right and left fibula of L.5.

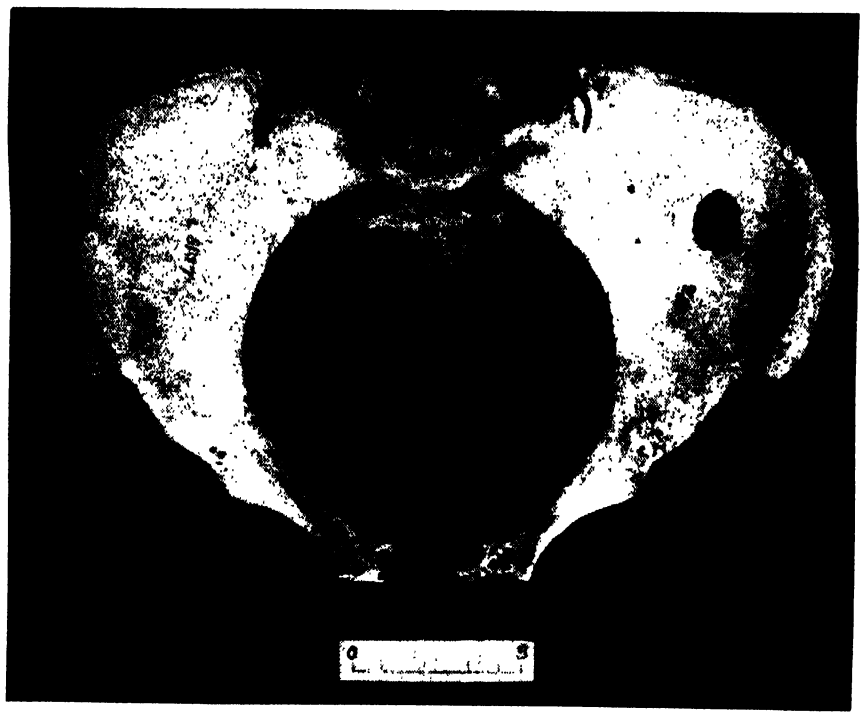


Fig. 3. Pelvis (L.5), viewed from top.

PHOTOGRAPHS : PELVIS, TIBIA AND FIBULA

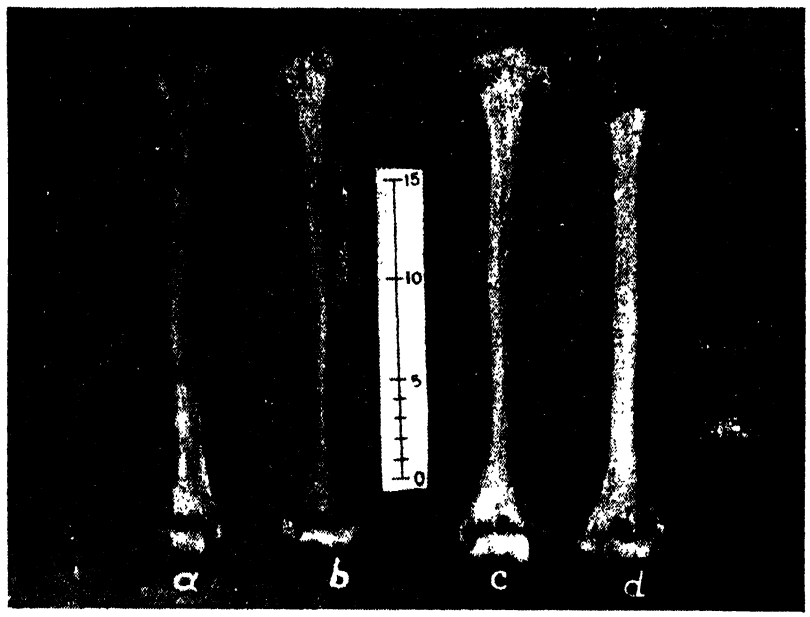


**Fig. 1.** a, b, flexor aspect of right and left humerus of L.5 ; c, d, flexor aspect of right and left humerus of L.1.

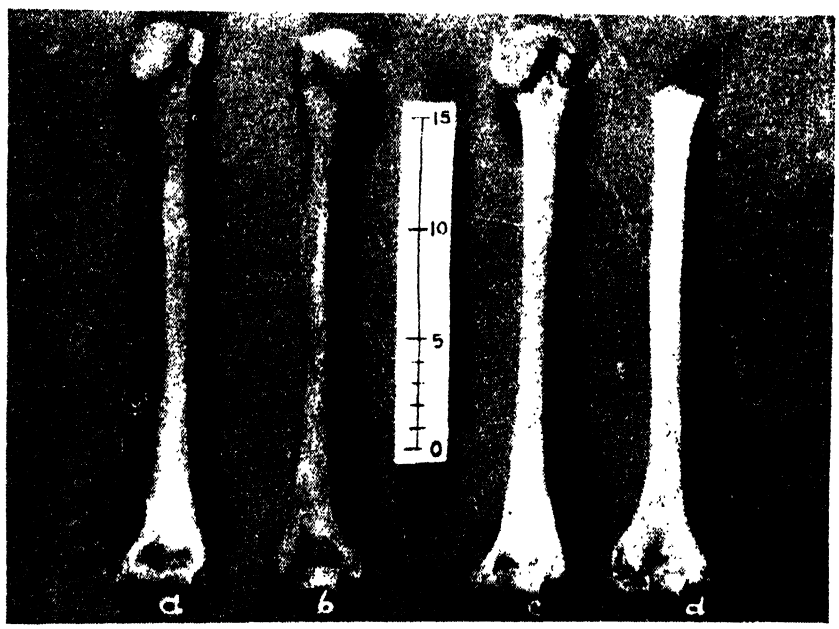


**Fig. 2.** a, b, extensor aspect of right and left humerus of L.5 ; c, d, extensor aspect of right and left humerus of L. 1

**PHOTOGRAPHS : HUMERUS**

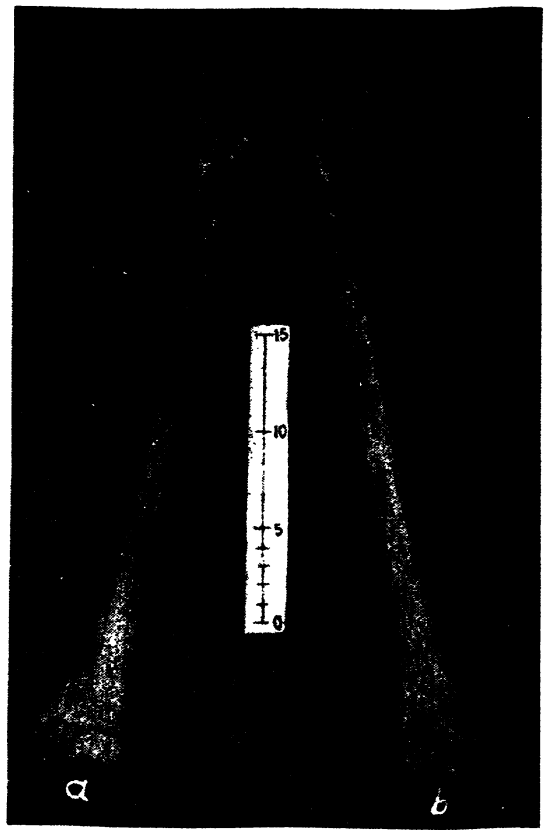


Fig. 3. Anterior aspect of the femora of L.5.
a, left ; b, right.

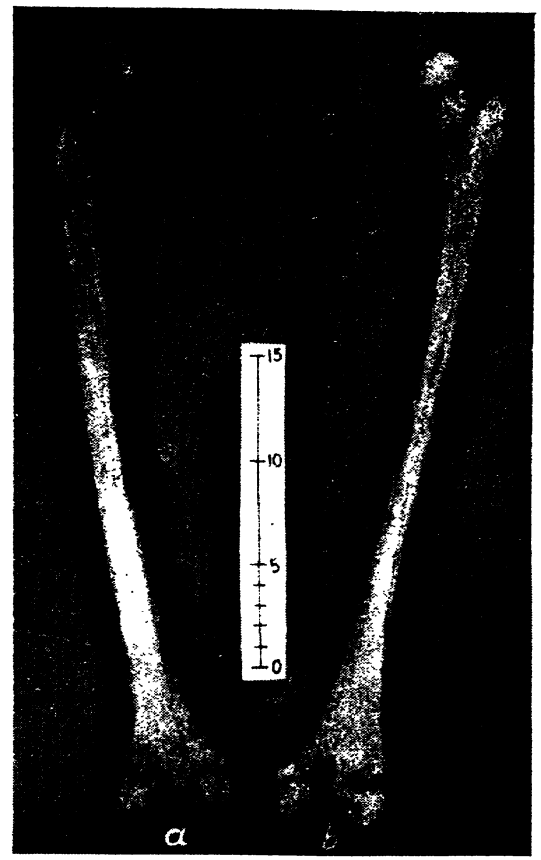


Fig. 4. Posterior aspect of femora of L.5.
a, left ; b, right.

PHOTOGRAPH : FEMUR

# DERMATOGLYPHICS OF THE SANTALS OF WEST BENGAL

M. R. CHAKRAVARTTI

## INTRODUCTION

The dermatoglyphic data on the Santals of Midnapore district were collected by the present author from the villages of Jambani, Sealdanga and Vichitrapur during the month of May, 1957. The Santals are a Mundari speaking people with short stature; medium nose and dolichocephalic head (Sarkar, 1954). They are mainly agriculturists. Their population is 845,395 in West Bengal according to 1951 census. The Santals have also migrated extensively in tea gardens, coal mines in various parts of Eastern India.

## THE DATA

The dermatoglyphic data comprise 123 individuals, 62 males and 61 females. Both the finger and palm prints were collected. The data belonged to unrelated persons.

## ANALYSIS OF THE DATA

### PAPILLARY PATTERNS

The finger prints of the two sexes are given separately in Table 1.

It will be seen from Table 1 that the males possess more whorls (52.51%) than the females

TABLE 1

**Distribution of Papillary Patterns**

**MALES**

| | Lt. | | | | | Rt. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Patterns** | **I** | **II** | **III** | **IV** | **V** | **I** | **II** | **III** | **IV** | **V** | **TOTAL** |
| Whorl | 37 | 37 | 25 | 45 | 17 | 42 | 32 | 20 | 48 | 22 | 325 |
| % | 5.98 | 5.98 | 4.04 | 7.27 | 2.75 | 6.79 | 5.17 | 3.23 | 7.75 | 3.55 | 52.51 |
| Loop R | 1 | 6 | — | — | — | — | 6 | — | — | — | 13 |
| % | 0.16 | 0.97 | — | — | — | — | 0.97 | — | — | — | 2.10 |
| Loop U | 23 | 17 | 36 | 16 | 45 | 19 | 20 | 41 | 14 | 40 | 271 |
| % | 3.72 | 2.75 | 5.82 | 2.58 | 7.27 | 3.07 | 3.23 | 6.62 | 2.26 | 6.46 | 43.78 |
| Arch | 1 | 2 | 1 | 1 | — | 1 | 3 | 1 | — | — | 10 |
| % | 0.16 | 0.32 | 0.16 | 0.16 | — | 0.16 | 0.49 | 0.16 | — | — | 1.61 |
| Total | 62 | 62 | 62 | 62 | 62 | 62 | 61 | 62 | 62 | 62 | 619 |

**FEMALES**

| **Patterns** | **I** | **II** | **III** | **IV** | **V** | **I** | **II** | **III** | **IV** | **V** | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Whorl | 31 | 39 | 27 | 38 | 17 | 29 | 40 | 17 | 39 | 19 | 296 |
| % | 5.08 | 6.39 | 4.43 | 6.23 | 2.79 | 4.75 | 6.56 | 2.79 | 6.39 | 3.11 | 48.52 |
| Loop R | 1 | 3 | — | — | — | 2 | 6 | 1 | — | — | 13 |
| % | 0.16 | 0.49 | — | — | — | 0.34 | 0.99 | 0.16 | — | — | 2.13 |
| Loop U | 21 | 13 | 33 | 22 | 44 | 25 | 13 | 43 | 20 | 42 | 276 |
| % | 3.44 | 2.13 | 5.41 | 3.61 | 7.21 | 4.10 | 2.13 | 7.05 | 3.28 | 6.89 | 45.25 |
| Arch | 8 | 6 | 1 | 1 | — | 5 | 2 | — | 2 | — | 25 |
| % | 1.31 | 0.98 | 0.16 | 0.16 | — | 0.81 | 0.34 | — | 0.34 | — | 4.10 |
| Total | 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 | 610 |

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(48.52%) while the loops occur more (47.38%) in the females than the males (45.88%). These percentages, however, do not agree with those of Biswas (1957). Verma (1952) described the unpublished data of Biswas in which the percentages of whorls, loops and arches were said to be 38.8, 57.2 and 4.0 respectively. Bhattacherjee (1955) also quoted the above figures of Verma and in the same issue of the journal, Singh (1955) quotes another set of figures for the same people. Biswas, writing in 1957, did not correct the earlier figures given by Verma (1952) and Bhattacherjee (1955) and gave the following percentages based on 21 male individuals; whorls (50.47%) ; loops (49.05%) and arch (0.47%).

It is, therefore, difficult to assess the above two contradictory figures and no comparison with the Santal data of the present writer could be undertaken. Contrary to the Australoid ratio of 60 : 40 (W : L) (Sarkar, 1954) the Juangs and the Sabaras (Sarkar and Banerjee, 1957) of Orissa, the Pahira females (Chakravartti, 1959), the Munda females (Chakravarti, unpublished) show more loops than whorls. The W-L ratio, however, appears to be approximately 40 : 60 (W : L) just the reverse of the Australoid ratio. The frequency of the papillary patterns of the Munda males (Chakravartti, unpublished) shows a picture different from either of the above two ratios. They show an almost equal percentage of whorls (49.65%) and loops (48.38%). The Santal finger prints, also appear to be similar to the Mundas in many respects. The equal whorl-loop ratio of the Munda males, is also seen among the Santal females. Arches are also seen more in the females (4.10%) than the males (1.61%).

Whorls and Ulnar loops occur in all the digits of the two hands in both the sexes. The highest frequency of whorls among the males is seen on the IV digit in both the hands while among females it occurs in the highest percentage on II digit. Ulnar loops appear in the highest percentage on the V digit of left hand and III digit of the right hand and this happens equally in both the sexes. The second highest percentage of Ulnar Loops is seen in the III digit in the case of the left hand and in the V digit of the right hand.

It will be seen from the Table 2 that the general order of the comparative occurrence of whorls and loops varies to some extent in the individual digits. W > L occurs in I, II and IV digits of the two hands of both the sexes while in the III and V digits of the two hands of both the sexes the order is changed to L > W. In both sexes the prevailing order appears to be W > L.

Radial loops occur in the I and II digits of the left hand and in the II digit of the right hand of the males while in the females they are found in the I and II digits of the left hand and in the I—III digits of the right hand. Arches are seen in all the digits of the males excepting the V left and IV and V digits of the right hand, while in females they occur in I—IV digits of the left hand and I, II and IV digits of the right hand. In the males the combined whorl-loop ratio for the fingers I, II and IV varies between 1 : 1.41 and 1 : 3.10 with a mean of 2.12 while the loop-whorl ratio for the fingers III and V varies between 1 : 1.71 and 1 : 2.18 with a mean of 1.94. In the females, the whorl-loop ratio for the fingers I, II and IV varies between 1 : 1.22 and 1 : 2.26 with a mean of 1.77 while the loop-whorl ratio for the fingers III and V varies between 1 : 1.75 and 1 : 2.39 with a mean of 2.07.

Table 3 shows the different patterns in the sexes along with the different indices derived out of them. The males possess a slightly higher pattern intensity index (15.09) than the females (14.44). The female arch-whorl Index (8.45) is as usual

TABLE 2

**Comparative Occurrence of Whorls and Loops (R+U) in Different Digits**

| Digit | M | | | | S | | | |
|---|---|---|---|---|---|---|---|---|
| | Lt | Rt | Lt & Rt Combination | W - L Ratio | Lt | Rt | Lt & Rt Combination | W - L Ratio |
| I | W > L | W > L | W > L | : 1.84 | W > L | W > L | W > L | 1.22 |
| II | W > L | W > L | W > L | : 1.41 | W > L | W > L | W > L | 2.26 |
| III | L > W | L > W | L > W | : 1.71 | L > W | L > W | L > W | 1.75 |
| IV | W > L | W > L | W > L | : 3.10 | W > L | W > L | W > L | 1.83 |
| V | L > W | L > W | L > W | : 2.18 | L > W | L > W | L > W | 1 : 2.39 |

TABLE 3

**Percentage of Papillary Patterns and the Indices derived out of them**

| | LOOPS | | | | | P. I. | A. W. | W.L. |
|---|---|---|---|---|---|---|---|---|
| | Whorl | Radial | Ulnar | Total | Arch | Index | Index | Index |
| Santal (M) | 52.51 | 2.10 | 43.78 | 45.88 | 1.61 | 15.09 | 3.07 | 114.45 |
| Santal (F) | 48.52 | 2.13 | 45.25 | 47.88 | 1.10 | 11.41 | 8.15 | 102.41 |

higher than the males (3.07). The whorl-loop Index is 114.45 in the males while in the females it is 102.41.

The Bimanuar (Figs. 1 and 2) shows the highest peak at 6W4L (14.74%) in the males and at 4W6L (18.03%) in the females.

SYMMETRY AND ASYMMETRY

Sexual difference is apparent in the frequency of Monomorphic hands (Table 4). It occurs in 15.32% among the males and in 18.85% among the females.

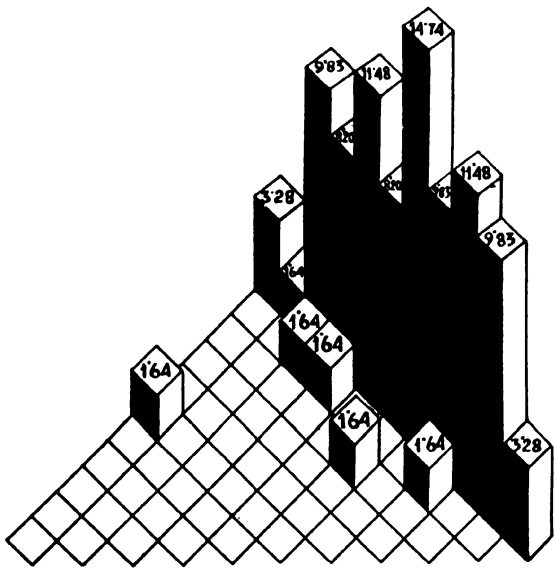


FIG. 1 SANTAL ♂

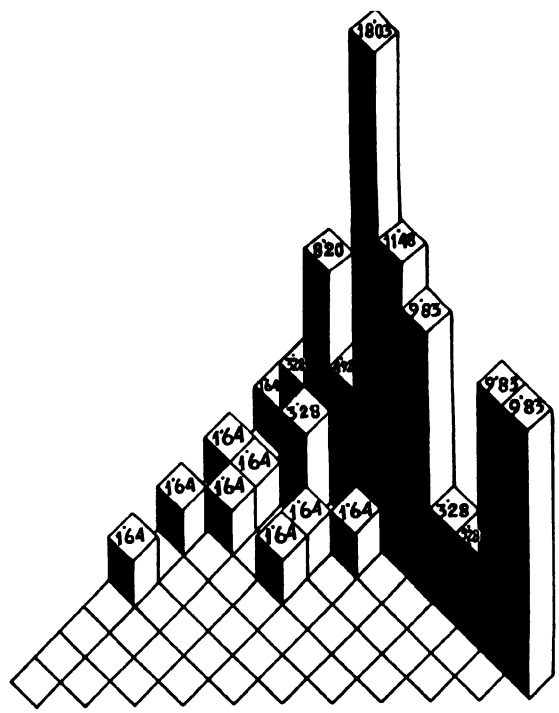


FIG. 2 SANTAL ♀

TABLE 4

**Distribution of Monomorphic Hands**

| | Males | | | | | | Females | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pattern | Lt | % | Rt | % | Total | % | Lt | % | Rt | % | Tota | |
| Whorl | 6 | 9.68 | 7 | 11.29 | 13 | 10.48 | 11 | 18.03 | 8 | 13.11 | 19 | |
| Loop U | 4 | 6.45 | 2 | 3.23 | 6 | 4.84 | 2 | 3.28 | 2 | 3.28 | 4 | 3.28 |

The percentages of symmetry and asymmetry in the two sexes show slight sexual difference. The overall symmetry and asymmetry frequencies are given in Table 5.

TABLE 5

**Symmetry and Asymmetry among the Santals**

| | Males | Females |
|---|---|---|
| Symmetry | 237 | 226 |
| % | 76.70 | 74.10 |
| Asymmetry | 72 | 79 |
| % | 23.30 | 25.90 |

The male Santals show a higher frequency of symmetry (76.70%) than the females (74.10%), while the frequency of asymmetry appears to be higher in the females (25.90%) than the males (23.30%).

The extent of symmetry, actually found and that due to chance (Dankmeijer and Renes, 1938 and Renes, 1946) in the papillary patterns is given in Table 6.

between 1.21 and 2.65 for whorls and between 6.19 and 9.94 for arch. The mean values of the af/cf ratio show their lowest value (1.59) for whorls, a higher one (1.74) for loops and the highest (3.22) for arch in the males, while in the females the lowest value is for loops (1.55), a higher one (1.70) for whorls and the highest (3.23) for arch.

In the same manner, the asymmetry due to chance and actual frequency is shown in Table 7.

It will appear from the Table 7 that the value of 'af' is less than that of 'cf' in the majority of the cases, excepting the II L-A and IV A-L in loop-arch combination; and I A-W, I W-A in the arch-whorl combination of the males and II A-L, III A-L, IV L-A and A-L in the loop-arch combination of the females, where 'af' is greater than 'cf'. The values of af/cf ratio in males range between 1.80 and 4.55 in the loop-arch combination between 0.26 and 0.77 in the whorl-loop combination and between 0.99 and 1.50 in the arch-whorl combination, whereas, in the females the values of af/cf ratio range between 0.85 and 3.15 between

TABLE 6

**Occurrence of Symmetry in Santals**

**MALES**

| | ARCH | | | LOOP | | | WHORL | | |
|---|---|---|---|---|---|---|---|---|---|
| Digit | cf | af | af/cf | cf | af | af/cf | cf | af | af/cf |
| I | — | — | — | 11.91 | 25.81 | 2.17 | 40.60 | 53.23 | 1.31 |
| II | 0.02 | 1.61 | 8.05 | 15.62 | 22.58 | 1.45 | 30.91 | 40.32 | 1.30 |
| III | 0.02 | 1.61 | 8.05 | 38.52 | 51.61 | 1.34 | 13.04 | 24.20 | 1.86 |
| IV | — | — | — | 5.83 | 14.52 | 2.49 | 56.34 | 66.13 | 1.17 |
| V | — | — | — | 46.96 | 59.68 | 1.27 | 9.76 | 22.58 | 2.31 |
| | Mean af/cf—3.22 | | | Mean af/cf—1.74 | | | Mean af/cf—1.59 | | |

**FEMALES**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| I | 1.06 | 6.56 | 6.19 | 15.98 | 29.51 | 1.85 | 24.13 | 39.34 | 1.63 |
| II | 0.33 | 3.28 | 9.94 | 8.14 | 13.11 | 1.61 | 41.91 | 50.82 | 1.21 |
| III | — | — | — | 39.00 | 47.54 | 1.22 | 12.35 | 21.31 | 1.75 |
| IV | — | — | — | 11.84 | 21.31 | 1.80 | 39.80 | 50.82 | 1.28 |
| V | — | — | — | 49.67 | 63.93 | 1.29 | 8.67 | 22.95 | 2.65 |
| | Mean af/cf—3.23 | | | Mean af/cf—1.55 | | | Mean af/cf—1.70 | | |

Table 6 shows that the values for actual symmetry are always higher than the chance symmetry. The af/cf ratio in the males varies between 1.27 and 2.49 for loops, between 1.17 and 2.31 for whorls and at 8.05 for arch. In the females, the af/cf ratio ranges between 1.22 and 1.85 for loops, 0.26 and 0.76 and between 0.26 and 0.78 in the above three combinations respectively.

The male mean af/cf ratio for the loop-arch combination is 0.63, for the whorl-loop 0.47 and for the arch-whorl 0.42, while in the females the

TABLE 7

**Occurrence of Asymmetrical Combinations**

**MALES**

| Digit | Loop — Arch Comb | cf | af | af/cf | Whorl — Loop Comb | cf | af | af/cf | Arch — Whorl Comb | cf | af | af/cf |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | L -A | — | — | | W -L | 18.35 | 4.84 | 0.26 | A -W | 1.09 | 1.64 | 1.50 |
| | A -L | — | — | | L -W | 26.34 | 12.90 | 0.49 | W -A | 0.96 | 1.64 | 1.50 |
| II | L -A | 1.82 | 3.28 | 1.80 | W -L | 23.11 | 19.35 | 0.77 | A W | 1.65 | 1.64 | 0.99 |
| | A -L | — | — | | L -W | 19.23 | 9.68 | 0.50 | W -A | | | |
| III | L -A | — | — | | W -L | 26.74 | 16.13 | 0.61 | A W | | | |
| | A -L | — | — | | L -W | 18.79 | 8.06 | 0.43 | W -A | | | |
| IV | L -A | — | — | | W -L | 16.43 | 6.15 | 0.39 | A -W | | | |
| | A -L | 0.36 | 1.64 | 4.55 | L W | 19.99 | 11.29 | 0.56 | W A | | | |
| V | L -A | — | — | | W L | 17.76 | 4.84 | 0.27 | A W | | | |
| | A -L | — | — | | L -W | 25.80 | 12.90 | 0.50 | W -A | | | |
| | Mean af/cf—0.63 | | | | Mean af/cf—0.47 | | | | Mean af/cf—0.12 | | | |

**FEMALES**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L -A | | | | W L | 22.55 | 9.84 | 0.44 | A -W | 6.22 | 1.64 | 0.10 |
| | A -L | 5.81 | 4.92 | 0.85 | L -W | 17.10 | 6.56 | 0.38 | W -A | 1.11 | 1.64 | 0.26 |
| | L -A | — | — | — | W -L | 19.87 | 13.11 | 0.66 | A -W | 6.12 | 1.64 | 0.26 |
| | A -L | 3.04 | 4.92 | 1.62 | L -W | 17.18 | 13.11 | 0.76 | W -A | | | |
| III | L -A | — | — | — | W L | 31.94 | 22.95 | 0.72 | A -W | | | |
| | A -L | 1.15 | 1.64 | 1.43 | L -W | 15.09 | 6.56 | 0.43 | W A | | | |
| IV | L -A | 1.22 | 1.64 | 1.34 | W -L | 20.43 | 9.84 | 0.48 | A -W | | | |
| | A -L | 0.52 | 1.64 | 3.15 | L -W | 23.06 | 13.11 | 0.51 | W -A | 2.11 | 1.64 | 0.78 |
| | L -A | | | | W L | 19.22 | 1.92 | 0.26 | A W | | | |
| | A -L | | | | L -W | 22.42 | 8.20 | 0.37 | W -A | | | |
| | Mean af/cf—0.84 | | | | Mean af/cf - 0.50 | | | | Mean af/cf - 0.17 | | | |

ratios are 0.84, 0.50 and 0.17 respectively. The constant value derived from the above three af/cf ratios works upto 0.51 in males and 0.50 in the females.

The pair group rule (Poll, 1938) is valid for both the sexes.

| MALES | FEMALES |
|---|---|
| $\Sigma P = 6.67$ | $\Sigma P = 2.84$ |
| $\Sigma G = 0.33$ | $\Sigma G = -0.08$ |
| $D = \Sigma P - \Sigma G$ | $D = \Sigma P - \Sigma G$ |
| $= 6.34$ (Valid) | $= 2.76$ (Valid) |
| $\Sigma P > \Sigma G$ | $\Sigma P > \Sigma G$ |

**GENE FREQUENCY**

The genetypic frequencies of the finger prints of the Santals as determined from the ridge counts are shown in Table 8.

From the Table 8 it appears that the thin epidermis (vv) is seen in highest percentage both in the males (53.23%) and females (57.38%). The heterozygote (Vv) is seen in the next highest frequency in the two sexes (males 38.71%) and (females 36.06%). Thick epidermis occurs in 8.06% in males and 6.56% in females.

The heterozygotes Rr and Uu occur in higher percentages in males than females, they being 61.29% and 56.45% respectively in males and 60.66% and 54.10% in females. The homozygote RR is seen in 27.42% in males and 29.50% in females, which is much lesser than the ulnar homozygote UU, it being 35.49% in males and 36.06% in females. The recessive genes uu and rr are 8.06% and 11.29% respectively in males while in the females both are found to be 9.84%.

It appears that the Santals of both the sexes are characterised by the highest frequency of thin epidermis. Thick epidermis appears to be higher among the males. The radial heterozygote (Rr) and the recessive rr appear to be higher than the corresponding ulnar genes while the homozygote UU is higher than RR, contrary to that found before where RR has been found to be greater than UU. Dankmeijer (1938) pointed out that sexual differ-

TABLE 8

**Frequency of Zygotes V, R and U of the Santals**

| | | Vv | VV | rr | Rr | RR | | Uu | UU |
|---|---|---|---|---|---|---|---|---|---|
| Santal (M) | 53.23 | 38.71 | 8.06 | 11.29 | 61.29 | 27.42 | 8.06 | 56.45 | 35.49 |
| Santal (F) | 57.38 | 36.06 | 6.56 | 9.84 | 60.66 | 29.50 | 9.84 | 54.10 | 36.06 |

ence in finger prints is similar to that observed in stature. In the present study no sexual difference has been found among the Santals Bonnevie (1924) did not find any sexual difference in one of her Norweigian samples. Unfortunately, most of the earlier data on finger prints, have not been collected on sex basis and a thorough enquiry is, therefore, not possible.

The quantitative values, as determined from the ridge counts, are 11.2 for males and 10.6 for females (Fig. 3)

## PALM PRINTS

### MAIN LINE FORMULA

The palmar prints of the Santals show the following line formulae in the two sexes.

The frequency of different main line formulae in the two hands of the two sexes is given in Table 10.

The main line formula 7.5.5- occurs in the highest percentage in both the sexes. In females, it is found in 31.40% while in the males in 33.33%. The formula 11.9.7- occurs in the next highest frequency in both the sexes; 25.62% in the females and 24.39% in the males. The formulae 9.7.5- and 9.9.5- occur in 14.05% and 9.09% respectively in the females while it is seen in 11.38% and 9.76% in the males respectively.

The percentage of the endings of the four main lines D, C, B and A of the two sexes is given in Table 11.

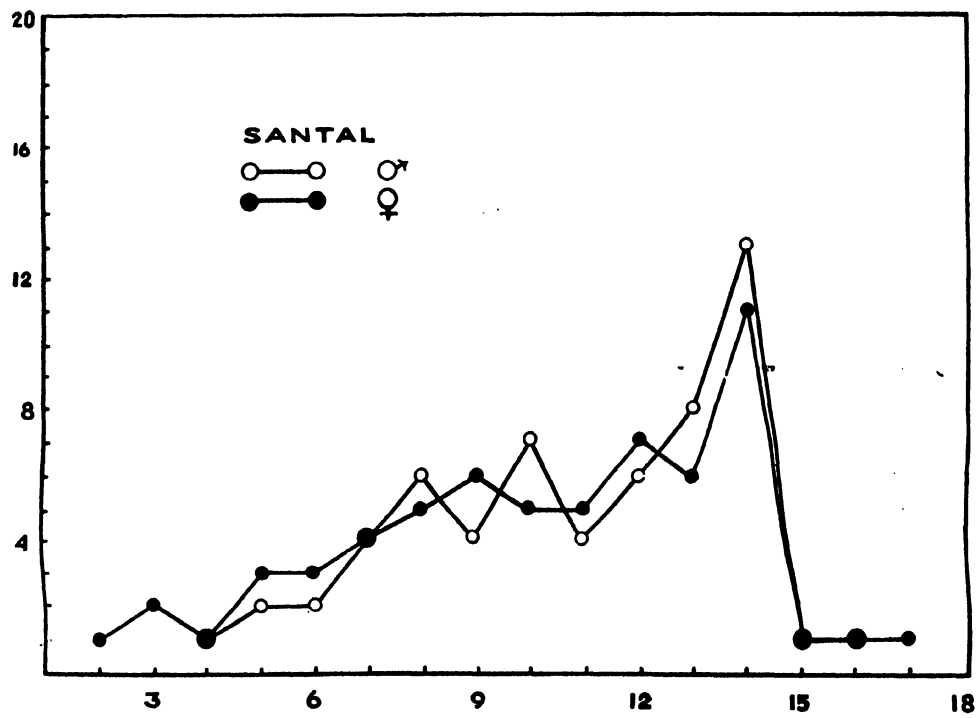


Fig. 3 Distribution Curve showing the quantitative value of the ridge counts

## TABLE 9

### Main line formulae

### MALES

| % | Abs. No. | Lt Hand | Rt Hand | Abs. No. | % |
|---|---|---|---|---|---|
| 34.42 | 21 | 7.5″.5″.5′ | | 20 | 32.26 |
| 3.28 | 2 | 9.7.5″.4 | | 2 | 3.23 |
| 4.92 | 3 | 9.7.5″.5′ | | 7 | 11.29 |
| 4.92 | 3 | 9.9.5″.5′ | | 1 | 1.61 |
| 9.84 | 6 | (7) 9.9.5″.5′ | | 2 | 3.23 |
| 4.92 | 3 | 9.0.5″.5′ | | 1 | 1.61 |
| 11.46 | 7 | 11.9.7.5′ | | 21 | 33.88 |
| 6.56 | 4 | 11.0.7.5′ | | 5 | 8.06 |
| 6.56 | 4 | 0.0.5″.5′ | | 1 | 1.61 |
| 1.64 | 1 | (7) 9.X.5″.5 | 11.9.7.4 | 1 | 1.61 |
| 1.64 | 1 | 9.9.7.5′ | (7) 11.9.5″.5′ | 1 | 1.61 |
| 1.64 | 1 | 9.0.5″.4 | | | |
| 3.28 | 2 | 9.X.5″.5 | | | |
| 3.28 | 2 | 11.X.7.5 | | | |
| 1.64 | 1 | 0.0.5″.4 | | | |

### FEMALES

| | | | | | |
|---|---|---|---|---|---|
| 13.11 | 8 | 7.5″.5″.4 | | 8 | 13.33 |
| 14.75 | 9 | 7.5″.5″.5′ | | 11 | 18.33 |
| 1.64 | 1 | 9.7.5″.4 | | 2 | 3.33 |
| 11.47 | 7 | 9.7.5″.5′ | | 5 | 8.33 |
| 4.92 | 3 | 9.9.5″.4 | | 1 | 1.67 |
| 4.92 | 3 | 9.9.5″.5′ | | 2 | 3.33 |
| 1.64 | 1 | (7) 9.9.5″.5′ | | 1 | 1.67 |
| 4.92 | 3 | 9.0.5″.5′ | | 1 | 1.67 |
| 1.64 | 1 | 9.X.5″.5′ | | 1 | 1.67 |
| 1.64 | 1 | 11.9.7.4 | | 4 | 6.67 |
| 13.11 | 8 | 11.9.7.5′ | | 16 | 26.66 |
| 1.64 | 1 | 11.7.7.5′ | | 1 | 1.67 |
| 1.64 | 1 | (7) 11.9.7.5′ | | 1 | 1.67 |
| 1.64 | 1 | 11.X.7.5′ | | 2 | 3.33 |
| 1.64 | 1 | 11.0.7.5′ | | 1 | 1.67 |
| 3.28 | 2 | 7.5″.5″.3 | 9.0.5″.4 | 1 | 1.67 |
| 1.64 | 1 | 7.X.5″.5′ | 0.9.7.5′ | 2 | 3.33 |
| 1.64 | 1 | (7) 9.7.5″.4 | | | |
| 1.64 | 1 | (7) 9.7.5″.5′ | | | |
| 1.64 | 1 | (7) 9.X.5″.5′ | | | |
| 1.64 | 1 | (7) 9.0.5″.4 | | | |
| 3.28 | 2 | 9.X.5″.4 | | | |
| 1.64 | 1 | 10.9.7.4 | | | |
| 1.64 | 1 | 11.X.7.3 | | | |
| 1.64 | 1 | 0.9.7.4 | | | |

## TABLE 10

### Frequency of Some Important Main Line Formulae

| | M | A | | L | E | S | F | | | | | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Formula | Lt | % | Rt | % | Total | % | Lt | | Rt | | Total | % |
| 11.9.7- | 7 | 11.47 | 23 | 37.10 | 30 | 24.39 | 10 | 16.39 | 21 | 35.00 | 31 | 25.62 |
| 9.7.5- | 5 | 8.19 | 9 | 14.52 | 14 | 11.38 | 10 | 16.39 | 7 | 11.67 | 17 | 14.05 |
| 7.5.5- | 21 | 34.43 | 20 | 32.26 | 41 | 33.33 | 19 | 31.15 | 19 | 31.67 | 38 | 31.40 |
| 9.9.5- | 9 | 14.75 | 3 | 4.84 | 12 | 9.76 | 7 | 11.48 | 4 | 6.67 | 11 | 9.09 |

TABLE 11

**Precentage of Endings of Main Lines D, C, B and A**

| | MALES | | | FEMALES | | |
|---|---|---|---|---|---|---|
| idings | Lt | Rt | Total | Lt | Rt | Total |
| | | | ENDINGS OF LINE—D | | | |
| 7 | 34.42 | 32.26 | 33.33 | 32.79 | 31.67 | 32.23 |
| 9 | 36.08 | 20.97 | 28.16 | 40.98 | 23.33 | 32.23 |
| 10 | — | — | — | 1.64 | — | 0.83 |
| 11 | 21.31 | 45.16 | 33.33 | 22.95 | 41.67 | 32.23 |
| 0 | 8.19 | 1.61 | 4.88 | 1.64 | 3.33 | 2.48 |
| | | | ENDINGS OF LINE—C | | | |
| 5″ | 34.42 | 32.26 | 33.33 | 31.15 | 31.67 | 31.41 |
| 7 | 8.19 | 14.52 | 11.38 | 18.03 | 13.33 | 15.70 |
| 9 | 27.88 | 41.93 | 34.97 | 31.15 | 45.00 | 38.02 |
| X | 8.19 | — | 4.06 | 11.47 | 5.00 | 8.26 |
| 0 | 21.32 | 11.29 | 16.26 | 8.20 | 5.00 | 6.61 |
| | | | ENDINGS OF LINE—B | | | |
| | 77.05 | 54.84 | 65.85 | 73.77 | 55.00 | 64.46 |
| | 22.95 | 45.16 | 34.15 | 26.23 | 45.00 | 35.54 |
| | | | ENDINGS OF LINE—A | | | |
| | | | | 4.92 | — | 2.48 |
| | 9.84 | 4.84 | 7.32 | 31.15 | 26.67 | 28.93 |
| | 90.16 | 95.16 | 92.68 | 63.93 | 73.33 | 68.59 |

It will be seen from Table 11 that line D, in males, ends in 7 and in 11 in the equal percentage of 33.33, in 9 in 28.46% and it is absent in 4.88% while in the females it is found in 7.9, and 11 in the equal percentage of 32.23 and in 10 in 0.83%. It is absent in 2.48.

Line C ends, in males in 9 in 34.97% ; in 5″ in 33.33% and in 7 in 11.38% and in the females in 38.02%, 31.41% and 15.70% respectively. In males it is absent (O) in 16.26% and abortive (X) in 4.06% while the respective percentage in the females are 6.61 and 8.26.

Line B ends in males in 5″ in 65.85% and in 7 in 34.15% while in the females it is seen in 64.46% and 35.54% respectively.

Line A ends in males in 4 in 7.32% and in 5′ in 92.68% while in the females it ends in 3 in 2.48%, in 4 in 28.93% and in 5′ in 68.59%.

The two sexes appear to differ more in the absence of main lines C and D which are found in a much higher percentage among the males (16.26% and 4.88% respectively) than the females (6.61% and 2.48% respectively). Its abortive form is, however, more met with among the females (8.26%) than the males (4.06%).

#### PATTERNS ON THE HYPOTHENAR AREA

The patterns on the Hypothenar area show almost equal distribution in the two sexes. The frequency of Hypothenar patterns is shown in Table 12.

The two sexes thus appear to preponderate in loops and a very low percentage of arches. The males possess 23.58% of loops in comparison to 22.31% in females.

#### PATTERNS ON THE THENAR AND I INTERDIGITAL AREA

The females possess more patterns on the Thenar area (25.62%) than the males (13.01%) as shown in Table 13.

TABLE 12

**Patterns on the Hypothenar area**

| | M | | A | | L | | E | | S | | F | | E | | M | | A | | L | | E | | S | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pattern | Lt | % | Rt | % | Total | % | Lt | % | Rt | % | Total | % | | | | | | | | | | | | |
| Lr | 15 | 24.59 | 11 | 17.74 | 26 | 21.18 | 16 | 26.23 | 9 | 15.00 | 25 | 20.66 | | | | | | | | | | | | |
| Lu | 1 | 1.64 | 1 | 1.61 | 2 | 1.63 | 1 | 1.64 | — | — | 1 | 0.83 | | | | | | | | | | | | |
| Lu/Lr | — | — | 1 | 1.61 | 1 | 0.80 | 1 | 1.64 | — | — | 1 | 0.83 | | | | | | | | | | | | |
| Ac | — | — | 1 | 1.61 | 1 | 0.80 | 1 | 1.64 | 1 | 1.67 | 2 | 1.65 | | | | | | | | | | | | |
| M/V | 4 | 6.56 | 10 | 16.13 | 14 | 11.37 | 4 | 6.56 | 6 | 10.00 | 10 | 8.26 | | | | | | | | | | | | |
| O | 41 | 66.21 | 38 | 61.30 | 79 | 64.22 | 38 | 62.29 | 14 | 73.33 | 82 | 67.77 | | | | | | | | | | | | |
| The frequencies of the patterns of arches and loops extracted from the table above, are shown below : | | | | | | | | | | | | | | | | | | | | | | | | |
| Loop | 16 | 26.23 | 13 | 20.97 | 29 | 23.58 | 18 | 29.51 | 9 | 15.00 | 27 | 22.31 | | | | | | | | | | | | |
| Arch | | | 1 | 1.61 | 1 | 0.81 | 1 | 1.64 | 1 | 1.67 | 2 | 1.65 | | | | | | | | | | | | |

TABLE 13

**Patterns on the Thenar and I Interdigital area**

| | M | | A | | L | | E | | S | | F | | E | | M | | A | | L | | E | | S | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pattern | Lt | % | Rt | % | Total | % | Lt | % | Rt | % | Total | % | | | | | | | | | | | | |
| O | 51 | 83.61 | 56 | 90.32 | 107 | 86.99 | 48 | 78.68 | 17 | 78.33 | 95 | 78.51 | | | | | | | | | | | | |
| Lr | 9 | 14.75 | 3 | 4.84 | 12 | 9.76 | 6 | 9.84 | 1 | 6.67 | 10 | 8.26 | | | | | | | | | | | | |
| Ar | 1 | 1.64 | 3 | 4.84 | 4 | 3.25 | 6 | 9.84 | 8 | 13.33 | 14 | 11.57 | | | | | | | | | | | | |
| W/Lr | — | — | — | — | — | — | 1 | 1.64 | — | — | 1 | 0.83 | | | | | | | | | | | | |
| Lr/Lc | — | — | — | — | — | — | — | — | 1 | 1.67 | 1 | 0.83 | | | | | | | | | | | | |
| The frequencies of the patterns of arches and loops extracted from the table above, are shown below : | | | | | | | | | | | | | | | | | | | | | | | | |
| Loop | 9 | 14.75 | 3 | 4.84 | 12 | 9.76 | | 11.17 | 1 | 6.67 | 11 | 9.09 | | | | | | | | | | | | |
| Arch | 1 | 1.64 | 3 | 4.84 | 4 | 3.25 | | 9.84 | 11 | 23.33 | 20 | 16.53 | | | | | | | | | | | | |

In both the males and the females loops are seen in 9.76% and 9.09% respectively. The pattern arch is, however, seen in a higher percentage in the females (16.53%) than the males (3.25%). The ratio between the Hypothenar and the Thenar patterns works upto 1.87 for males and 0.94 for females.

PATTERNS ON THE INTERDIGITALS

The patterns on the II, III and IV interdigital areas are shown in Table 14.

TABLE 14

**Patterns on the II, III and IV Interdigital areas**

| | M | | A | | L | | E | | S | | | E | M | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Combi-nation | Lt | % | Rt | % | Total | % | Lt | % | Rt | % | Total | % | | | | |
| O-O-O | 16 | 26.23 | 15 | 24.19 | 31 | 25.20 | 18 | 29.51 | 15 | 23.00 | 33 | 27.27 | | | | |
| O-O-L | 33 | 54.10 | 23 | 37.11 | 56 | 45.54 | 29 | 47.54 | 18 | 30.00 | 47 | 38.84 | | | | |
| O-L-L | 4 | 6.56 | 4 | 6.45 | 8 | 6.50 | | 8.20 | 6 | 10.00 | 11 | 9.09 | | | | |
| O-L-O | 8 | 13.11 | 12 | 19.35 | 20 | 16.26 | | 13.11 | 13 | 21.67 | 21 | 17.36 | | | | |
| L-L-L | — | — | 4 | 6.45 | 4 | 3.25 | | — | 3 | 5.00 | 3 | 2.48 | | | | |
| L-L-O | — | — | 1 | 1.61 | 1 | 0.81 | | 1.64 | | 3.33 | 3 | 2.48 | | | | |
| L-O-O | — | — | 2 | 3.23 | 2 | 1.63 | | | | | | | | | | |
| L-O-L | — | — | 1 | 1.61 | 1 | 0.81 | | | | 5.00 | | 2.48 | | | | |

It will be clear from the above table that the combination O-O-L is preponderant in both the sexes. It is 45.54% in the males and 38.84% in the females. The combination O-O-O occurs in the next highest percentage in both sexes, 25.20% in males and 27.27% in the females. The combination O-L-O is seen in 16.26% in males and in 17.36% in females.

In general, the patterns on the Hypothenar, Thenar and the three interdigitals occur in the following percentage in the two sexes.

| | Males | Females |
|---|---|---|
| | % | % |
| Hypothenar | 24.39 | 23.96 |
| Thenar/I Int. | 13.01 | 25.62 |
| II—Int. | 6.50 | 7.44 |
| III—Int. | 26.82 | 31.41 |
| IV—Int. | 56.10 | 52.89 |

**AXIAL TRIRADII**

The frequency of the Axial triradii appears as follows:

TABLE 15

**Percentage Distribution of Axial Triradii**

| | MALES | | | FEMALES | | |
|---|---|---|---|---|---|---|
| Pattern | Lt | Rt | Total | Lt | Rt | Total |
| t | 51 | 49 | 100 | 43 | 48 | 91 |
| % | 83.60 | 79.03 | 81.29 | 70.49 | 80.00 | 75.21 |
| t′ | 6 | 6 | 12 | 13 | 9 | 22 |
| % | 9.84 | 9.68 | 9.76 | 21.31 | 15.00 | 18.18 |
| t″ | 2 | 4 | 6 | 3 | 2 | 5 |
| % | 3.28 | 6.45 | 4.86 | 4.92 | 3.33 | 4.13 |
| tt′ | 1 | 1 | 2 | 1 | — | 1 |
| % | 1.64 | 1.61 | 1.63 | 1.64 | — | 0.83 |
| tt″ | 1 | 2 | 3 | 1 | 1 | 2 |
| % | 1.64 | 3.23 | 2.44 | 1.64 | 1.67 | 1.65 |

It will be seen from the table above that the Axial triradii 't' preponderates in both the sexes. In males, it occurs in 81.29% while in females it is seen in 75.21%. 't' occurs in the next highest percentage in the two sexes, males 9.76% and females 18.18%.

## SUMMARY

| Sl. No. | Characters | MALES | FEMALES |
|---|---|---|---|
| 1. | Finger prints | Whorl 52.51% | 48.52% |
| | | Loop Radial 2.10% | 2.13% |
| | | Loop Ulnar 43.78% | 45.25% |
| | | Arch 1.61% | 4.10% |
| 2. | Comparative occurrence of Loops-Whorls | W > L in I, II & IV digits of both the hands; L > W in III and V of both hands. | W > L in I, II & IV digits of both hands; L > W in III & V of both hands. |
| 3. | Pattern Intensity Index | 15.09 | 14.44 |
| 4. | Arch-Whorl Index | 3.07 | 8.45 |
| 5. | Whorl-Loop Index | 114.45 | 102.41 |
| 6. | Bimanuar | Highest peak at 6W4L (11.74%) | Highest peak at 4W6L (18.03%) |
| 7. | Monomorphic hands | 15.30% | 18.85% |
| 8. | Symmetry | 76.70% | 74.10% |
| 9. | Asymmetry | 23.30% | 25.90% |
| 10. | Actual frequency & chance frequency | af > cf | af > cf |
| 11. | Mean af/cf ratio (symmetry) | Arch 3.22 (Highest) | 3.23 (Highest) |
| | | Loop 1.74 (Higher) | 1.55 (Lowest) |
| | | Whorl 1.59 (Lowest) | 1.70 (Higher) |
| 12. | Range of af/cf (symmetry) | Arch 8.05 | 6.10 to 9.94 |
| | | Loop 1.27 to 2.49 | 1.22 to 1.85 |
| | | Whorl 1.17 to 2.31 | 1.21 to 2.65 |
| 13. | Asymmetrical combination | af < cf | af < cf |
| 14. | Mean af/cf ratio (asymmetry) | Loop—Arch = 0.63 | 0.84 |
| | | Whorl—Loop = 0.47 | 0.50 |
| | | Arch—Whorl = 0.42 | 0.17 |
| 15. | Range of af/cf (asymmetry) | L-A. 1.80 to 4.55 | 0.85 to 3.15 |
| | | W-L. 0.26 to 0.77 | 0.26 to 0.76 |
| | | A-W 0.99 to 1.50 | 0.26 to 0.78 |

| Sl. No. | Characters | MALES | | FEMALES | |
|---|---|---|---|---|---|
| 16. | Constant value | 0.51 | | 0.50 | |
| 17. | Pair group rule | D = 6.34 (Valid) | | D = 2.76 (Valid) | |
| | | $\Sigma P > \Sigma G$ | | $\Sigma P > \Sigma G$ | |
| 18. | Gene frequency | Thin epidermis (vv) Rr, > rr Uu > uu UU > RR | | Thin epidermis (vv) Thick epidermis is more than males Rr > rr Uu > uu UU > RR | |
| 19. | Palm main lines | 11.9.7- 21.39% | | 25.62% | |
| | | 9.7.5- 11.38% | | 14.05% | |
| | | 7.5.5-33.33% | | 31.10% | |
| 20. | Endings of D, C, B & A | D ends in 7, 11, 9 & 0 | | 7, 9, 10, 11 & 0 | |
| | | C ends in 9, 5″, 7 | | 9, 5″, 7 | |
| | | B ends in 5″, 7 | | 5″, 7 | |
| | | A ends in 1 & 5′ | | 3, 1 & 5′ | |
| 21. | Absence of Main Line—C | 'O' | 16.26% | 6.61% | |
| | | 'X' | 4.06% | 8.26% | |
| 22. | Hypothenar | | 24.39% | 6.61% | |
| 23. | Thenar / I Int. | | 13.01% | 25.62% | |
| 24. | Ratio between (22) and (23) | | 1.87 | 0.91 | |
| 25. | Interdigitals | II | 6.50% | 7.41% | |
| | | III | 26.82% | 31.41% | |
| | | IV | 56.10% | 52.89% | |
| 26. | Axial triradii | 't' | 81.29% | 't' | 75.21% |

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# PHYSICAL CHARACTERS OF THE MADIGA OF GUNTUR DISTRICT- A PARIAH CASTE OF ANDHRA

PABITRA GUPTA AND ARABINDA BASU

## INTRODUCTION

The Madiga, an untouchable Telegu-speaking caste of Andhra, are scattered all over the State. They occupy the lowest status in the Hindu society. Generally, they live outside the main village in agglomerated hamlets. Their traditional occupation is tanning of skin and making leather articles such as shoes, buckets and belts etc. The impact of Christianity on them is remarkable and a considerable number of this low caste has been converted by the missioneries. Incidentally, the Madiga, we measured somatometrically are converts. They, however, have retained the essentials of casteism, especially caste endogamy.

Physical measurements were taken during January-April 1960 from Palnad taluq of Guntur district, from various local populations of the area, in order to estimate the affinity or otherwise of the present day population of the soil with the human skeletal remains of Nagarjunkonda, the famous archaeological site. Excavation of the skeletons from the megaliths were done by the writers simultaneously.

Anthropometric data on 70 Madiga were collected by Thurston during the early part of this century, which forms the only previous anthropometric record on them. Measurements on 102 adult male individuals were done by the present writers from nine villages as follows: Nagulvaram 30, Kansaragunta 20, Koppunur 15, Mutukkur 7, Veldurti 6, Parapally and Pulareddigudem 4 each, Koalagotla 3 and Mandari 2. Besides them, eleven subjects hailing from neighbouring villages were measured at the base camp at Nagarjunakonda.

Technique of measurement followed is that of Martin. Auricular head height was taken by Schultz's parallelometer. For other measurements a set of Hermann, Richenboch and Son's anthropometric instruments was used. Skin colour and eye colour observations were done with the help of v. Luschan's and Martin-Schultz's charts respectively. Hair colour was observed without reference to any chart. Statistical constants of the measurements and indices are shown in Table 20 and 21 respectively.

## ANALYSIS OF DATA

### AGE DISTRIBUTION

According to 5 years class interval, the distribution of the age of the individuals is as follows:

TABLE 1

| Age | | Frequency | Percentage |
|---|---|---|---|
| 20-24 | ... | 23 | 22.55 |
| 25-29 | ... | 22 | 21.57 |
| 30-34 | ... | 24 | 23.53 |
| 35-39 | ... | 15 | 14.71 |
| 40-44 | ... | 5 | 4.90 |
| 45-50 | ... | 13 | 12.75 |
| | | 102 | 100.01 |

Table 1 shows that highest frequencies are observed between 20 years to 34 years. 68% of the population fall within these ages. The remaining 32% belong to the ages between 35 years to 50 years. Age groups of 30-34 years, 20-24 years and 25-29 years have the incidence of 23.53%, 22.55% and 21.57% respectively .

### BODY HEIGHT

Body height of the Madiga is classified as follows:

TABLE 2

| Classes | | Frequency | Percentage |
|---|---|---|---|
| Very Short (1300-1499) | ... | 3 | 2.94 |
| Short (1500-1599) | ... | 31 | 30.39 |
| Below medium (1600-1639) | ... | 28 | 27.45 |
| Medium (1640-1669) | ... | 19 | 18.63 |
| Above medium (1670-1699) | | 10 | 9.80 |
| Tall (1700-1799) | ... | 11 | 10.78 |
| | | 102 | 99.99 |

It is apparent from Table 2 that maximum concentration of stature is observed in 'short' class (30.39%) closely followed by 'below medium' (27.45%). While 'medium' class is attributed to 18.63%, 'above medium' and 'tall' classes are represented by 9.80% and 10.78% respectively. 'Very short' stature is also observed among 2.94% population. Mean is 1619.52 ± 6.06 mm, which lies in the 'below medium' class. The range of variation is 1452 mm to 1777 mm.

### SITTING HEIGHT

Sitting height falls in the following classes:

TABLE 3

| Classes | Frequency | Percentage |
|---|---|---|
| Low (750-799) ... | 41 | 40.20 |
| Below medium (800-849) ... | 52 | 50.98 |
| Medium (850-899) ... | 9 | 8.82 |
| | 102 | 100.00 |

It appears from Table 3 that the 'below medium' is the most highly represented class, its frequency being 50.98%, the next highest concentration is observed in the 'low' class (40.20%). Besides these, the only other class represented is the 'medium' class having a frequency of 8.82%. It is noteworthy that although 'above medium' and 'tall' classes of stature are present, these two classes go unrepresented in sitting height. Among the Madiga sitting height ranges between 750 mm to 876 mm and the average is 809.53 ± 2.77 mm.

### MAXIMUM HEAD LENGTH

According to Lebzelter and Saller's (1930) classification maximum head length is distributed as follows:

TABLE 4

| Classes | Frequency | Percentage |
|---|---|---|
| Very short (162-169) ... | 2 | 1.96 |
| Short (170-177) ... | 15 | 14.71 |
| Medium (178-185) ... | 41 | 40.20 |
| Long (186-193) ... | 41 | 40.20 |
| Very long (194-201) ... | 3 | 2.94 |
| | 102 | 100.01 |

It is observed from Table 4 that in maximum head length 'medium' and 'long' classes are the most highly represented with equal frequencies of 40.20%. Only 14.71% Madiga are 'short' headed. 'Very long' and 'very short' classes show frequencies of 2.94% and 1.96% respectively. The average is 183.70 ± 0.63 mm which lies in the 'medium' class. The maximum head length varies from 169 mm to 195 mm.

### MAXIMUM HEAD BREADTH

Extending Schlaginhaufen's (1946) classification by one class (extremely narrow), the following frequencies are obtained:

TABLE 5

| Classes | Frequency | Percentage |
|---|---|---|
| Extremely narrow (127-132) | 3 | 2.94 |
| Very narrow (133-138) ... | 19 | 18.63 |
| Narrow (139-144) ... | 47 | 46.06 |
| Below medium (145-150) ... | 30 | 29.41 |
| Medium (151-156) ... | 3 | 2.94 |
| | 102 | 99.98 |

The maximum head breadth of the Madiga is predominatly 'narrow' (46.06%). The next classes being represented by 29.41% and 18.63% of the population are 'below medium' and 'very narrow' heads. The mean is 141.99 ± 0.45 mm and the minimum and the maximum values are 129 mm and 155 mm respectively.

### LENGTH-BREADTH INDEX OF HEAD

TABLE 6

| Classes | Frequency | Percentage |
|---|---|---|
| Dolichocephal (71.0-75.9) .. | 40 | 39.22 |
| Mesocephal (76.0-80.9) ... | 47 | 46.06 |
| Brachycephal (81.0-85.4) ... | 14 | 13.73 |
| Hyperbrachycephal (85.5-X) | 1 | 0.98 |
| | 102 | 99.99 |

The Madiga are mesocephal and dolichocephal people, 46.06% being classed under the former category and 39.22% in the latter. Hyperdolichocephaly is conspicuously absent. Brachycephaly occurs among 13.73%, besides 0.98% being hyperbrachycephal. Notwithstanding the completely unrepresented classes of 'above medium', 'broad' and 'very broad' head breadth, the occurance of 13.73% brachycephaly may be attributed to 'short' and 'very short' classes of head length. The average is 77.36 ± 0.30 which lies in the mesocephal class and the range varies from 71.36 to 85.63.

Classified according to Routil (1932), auricular height gives the following distribution:

### AURICULAR HEIGHT

TABLE 7

| Classes | | Frequency | Percentage |
|---|---|---|---|
| Very low (X-109) | ... | 1 | 0.98 |
| Low (110-117) | ... | 36 | 35.29 |
| Medium (118-125) | ... | 59 | 57.84 |
| High (126-136) | ... | 6 | 5.88 |
| | | 102 | 99.99 |

Mostly the Madiga are 'medium' in their auricular head height (58%). 'Low' class occurs among 35% of the population and 'high' class among 6%. Mean is 118.87 ± 0.46 mm and the range varies between 109 mm to 131 mm.

### LENGTH-AURICULAR HEIGHT INDEX OF HEAD

The distribution of Length-auricular height index is shown as follows:

TABLE 8

| Classes | | Frequency | Percentage |
|---|---|---|---|
| Orthocephal (57.7-62.5) | ... | 22 | 21.57 |
| Hypsicephal (62.6 X) | ... | 80 | 78.43 |
| | | 102 | 100.00 |

The Madiga are mainly 'hypsicephal', 78.43% belonging to this class and the only other class represented is 'orthocephal' (21.57%). Notwithstanding the occurance of 35.29% of 'low' and 0.98% of 'very low' head height and 40.20% of 'long heads' 78.43% of hypsicephalic heads are conspicuous. Mean is 64.81 ± 0.27 and the range varies between 74.27 to 58.73.

### BREADTH-AURICULAR HEIGHT INDEX OF HEAD

Breadth-auricular height is distributed as follows:

TABLE 9

| Classes | | Frequency | Percentage |
|---|---|---|---|
| Tapeinocephal (X-78.9) | ... | 7 | 6.86 |
| Metriocephal (79.0-84.9) | .. | 63 | 61.76 |
| Akrocephal (85.0-X) | ... | 32 | 31.37 |
| | | 102 | 99.99 |

The proportion of auricular height to head breadth indicates that 62% fall in the 'metriocephal' class, 31% fall in the 'akrocephal' class and of the remaining, 7% fall in the 'tapeinocephal' class.

'Narrow', 'very narrow' and 'extremely narrow' heads combined with 'medium' and 'high' heads contribute towards the formation of metriocephal and akrocephal heads. Average for this index is 83.76 ± 0.34 and the minimum maximum values are 73.83 and 93.41 respectively.

### MINIMUM FRONTAL BREADTH

The following is the distribution of minimum frontal breadth according to Schlaginhaufen's classification:

TABLE 10

| Classes | | Frequency | Percentage |
|---|---|---|---|
| Narrow (X-94) | .. | 5 | 1.90 |
| Below medium (95 99) | .. | 27 | 26.47 |
| Medium (100 104) | ... | 54 | 52.94 |
| Above medium (105-109) | ... | 13 | 12.75 |
| Broad (110 X) | .. | 3 | 2.94 |
| | | 102 | 100.00 |

Highest frequency of 53% is attained by 'medium' foreheads, the next classes being the 'below medium' (26%) and 'above medium' (13%).

It is evident that 92% of the population have forehead of medium width. Mean is 100.78 ± 0.38 mm and the range varies between 92 mm to 110 mm.

### BIZYGOMATIC BREADTH

According to Lebzelter-Saller's classification (Schlaginhaufen, p. 158) bizygomatic breadth is distributed as follows:

TABLE 11

| Classes | | Frequency | Percentage |
|---|---|---|---|
| Very narrow (X-127) | ... | 12 | 11.76 |
| Narrow (128-135) | .. | 67 | 65.69 |
| Medium (136-143) | . | 23 | |
| | | 102 | 100.00 |

The breadth of the face, as seen from the classification table of bizygomatic breadth, is mainly narrow (66%). Of the rest 23% and 12% are 'medium' and 'very narrow' respectively. 'Broad' and 'very broad' classes are not met with. Average is 132.71 ± 0.41 mm and the range varries from 129 mm to 155 mm.

### JUGO-FRONTAL INDEX

The distribution of Jugo-frontal index according to Lundborg, Linders and Saller is shown as follows (Schlaginhaufen, p. 196) :

TABLE 12

| Classes | Frequency | Percentage |
|---|---|---|
| Very narrow (X-69.9) ... | 2 | 1.96 |
| Narrow (70.0-74.9) ... | 32 | 31.37 |
| Medium (75.0 79.9) ... | 61 | 59.80 |
| Broad (80.0 84.9) ... | 7 | 6.86 |
| | 102 | 99.99 |

The Jugo-frontal index shows that in 60% cases the foreheads are 'medium' in breadth in proportion to facial breadth and in 31% cases those are in 'narrow' class. In 7% it is 'broad' and in 2% it is 'very narrow'. The average is 75.99 ± 0.29 and the range varies between 66.90 to 83.33.

### MORPHOLOGICAL FACIAL HEIGHT

According to Lebzelter-Saller's classification (Schlaginhaufen, p. 146) the distribution of morphological facial height is as follows :

TABLE 13

| Classes | Frequency | Percentage |
|---|---|---|
| Very low (X-111) ... | 62 | 60.78 |
| Low (112 117) ... | 27 | 26.47 |
| Medium high (118-123) | 13 | 12.75 |
| | 102 | 100.00 |

Madiga are characterised by 'very low' face which is observed among 61% population. 'Low' face is present in 26% and 'medium high' face in 13% of the population. None of the individuals possesses a 'high' face. Average is 110.6 ± 0.62 mm and the range of variation is 98 mm to 123 mm.

### MORPHOLOGICAL FACIAL INDEX

Morphological facial index is distributed as follows :

TABLE 14

| Classes | Frequency | Percentage |
|---|---|---|
| Hypereuryprosop (X-78.9) | 20 | 19.61 |
| Euryprosop (79.0 83.9) | 42 | 41.18 |
| Mesoprosop (84.0-87.9) | 25 | 24.51 |
| Leptoprosop (88.0-92.9) | 14 | 13.73 |
| Hyperleptoprosop (93.0-X) | 1 | 0.98 |
| | 102 | 100.01 |

Highest frequency (41%) is attained by 'euryprosop' class. The next classes 'mesoprosop', 'hypereuryprosop' and 'leptoprosop' closely follow one after the other in their frequencies (25%, 20% and 14% respectively). Mean is 82.97 ± 0.45 and range is 72.59 to 93.80.

### BIOGONIAL BREADTH

According to Schlaginhaufen's classification bigonial breadth is classified as follows :

TABLE 15

| Classes | Frequency | Percentage |
|---|---|---|
| Short (X-89) | 2 | 1.96 |
| Below medium (90 99) | 49 | 48.04 |
| Medium (100-109) | 47 | 46.06 |
| Above medium (110 119) | 4 | 3.92 |
| | 102 | 99.98 |

'Below medium' is the most frequent class which occurs among 48% people. Nearly as often (46%) occurs the 'medium' class. 4% are 'above medium' and 2% are 'short' in this character.

Mean value is 99.35 ± 0.49 mm and the range varies between 89 mm to 112 mm.

### JUGO-MANDIBULAR INDEX

According to Schlaginhaufen's classification Jugo-mandibular index is distributed as follows :

TABLE 16

| Classes | Frequency | Percentage |
|---|---|---|
| Very narrow (X-69.9) ... | 3 | 2.94 |
| Narrow (70.0-74.9) ... | 52 | 50.98 |
| Medium (75.0-79.9) ... | 39 | 38.24 |
| Broad (80.0-84.9) ... | 7 | 6.86 |
| Very broad (85.0-X) ... | 1 | 0.98 |
| | 102 | 100.00 |

Nearly half of the population (51%) have 'narrow' mandible in relation to breadth of face. The next is the 'medium' class represented by 38% Madiga. Only 7% of them are 'broad' in this index. Mean is 74.88 ± 0.33 which stands on the border line of 'narrow' and 'medium' categories, and the range varies between 62.68 to 85.50.

### NASAL HEIGHT

The distribution of nasal height according to Schlaginhaufen's classification stands as follows :

TABLE 17

| Classes | Frequency | Percentage |
|---|---|---|
| Short (40-44) ... | 9 | 8.82 |
| Below medium (45-49) ... | 43 | 12.16 |
| Above medium (50-54) ... | 12 | 11.18 |
| Large (55-59) ... | 8 | 7.81 |
| | | 100.00 |

Nasal height is mainly of 'medium' category (83%), which is sub-divided into two nearly equal proportions of 'below medium' and 'above medium' classes. 'Short' and 'large' noses are also met with, their respective frequencies being 8.8% and 7.8%. Average is 49.53 ± 0.43 mm and the range varies between 41 mm to 58 mm.

### NASAL BREADTH

Breadth of nose classified according to Schlaginhaufen is as follows:

TABLE 18

| Classes | Frequency | Percentage |
|---|---|---|
| Medium (30-34) ... | 24 | 23.53 |
| Above medium (35-39) ... | 64 | 62.74 |
| Large (40-X) ... | 14 | 13.73 |
| | 102 | 100.00 |

Breadth of nose, similar to its height, is mainly concentrated in 'above medium' class, its frequency being 63%. The next class, with much less frequency (24%), is the 'medium' class. 'Large' class is represented by a frequency of 14%. Mean is 36.53 ± 0.27 mm and range is 30 mm to 44 mm.

### NASAL INDEX

Classification of nasal index is shown in the table below:

TABLE 19

| Classes | Frequency | Percentage |
|---|---|---|
| Leptorrhine (55.0-69.9) ... | 22 | 21.57 |
| Mesorrhine (70.0-84.9) ... | 73 | 71.57 |
| Chamaerrhine (85.0-99.9) ... | 7 | 6.86 |
| | 102 | 100.00 |

The Madiga are predominantly 'mesorrhine' with a frequency of 72%, achieved at the expense of leptorrhine and chamaerrine nose which occur at the frequency of 22% and 7% respectively. Mean is 74.01 ± 0.64 and range of variation is 58.93 to 88.37.

TABLE 20

STATISTICAL CONSTANTS OF MEASUREMENTS

| Measurements | Maximum | Minimum | Mean | S. E. | S. D. | S. E. | C. V. | S. E. |
|---|---|---|---|---|---|---|---|---|
| Stature ... ... ... ... | 1777 | 1452 | 1619.52 ± | 6.06 | 61.20 ± | 4.29 | 3.78 ± | 0.26 |
| Sitting Height ... ... ... ... | 876 | 750 | 809.53 ± | 2.77 | 27.96 ± | 1.96 | 3.45 ± | 0.24 |
| Auricular Height ... ... ... ... (Mean of L & R) | 131 | 109 | 118.87 ± | 0.46 | 4.67 ± | 0.33 | 3.93 ± | 0.28 |
| Maximum Head Length ... ... ... | 195 | 169 | 183.70 ± | 0.63 | 6.33 ± | 0.44 | 3.45 ± | 0.24 |
| Maximum Head Breadth ... ... ... | 155 | 129 | 141.99 ± | 0.45 | 4.59 ± | 0.32 | 3.23 ± | 0.23 |
| Minimum Frontal Breadth ... ... ... | 110 | 92 | 100.78 ± | 0.38 | 3.84 ± | 0.27 | 3.81 ± | 0.27 |
| Maximum Bizygomatic Breadth ... .. | 142 | 124 | 132.71 ± | 0.41 | 4.11 ± | 0.29 | 3.10 ± | 0.22 |
| Bigonial Breadth ... ... ... ... | 112 | 89 | 99.35 ± | 0.49 | 4.99 ± | 0.35 | 5.02 ± | 0.35 |
| Inter-orbital Breadth ... ... ... | 41 | 25 | 32.25 ± | 0.28 | 2.81 ± | 0.20 | 8.81 ± | 0.62 |
| Ext. Bipalpebral Breadth .. ... ... | 94 | 77 | 84.78 ± | 0.35 | 3.58 ± | 0.25 | 4.22 ± | 0.30 |
| Nasal Height ... ... ... .. | 58 | 41 | 49.53 ± | 0.34 | 3.45 ± | 0.24 | 6.97 ± | 0.49 |
| Nasal Breadth ... ... ... ... | 41 | 30 | 36.53 ± | 0.27 | 2.76 ± | 0.19 | 7.56 ± | 0.53 |
| Nasal Depth ... ... ... ... | 28 | 14 | 19.37 ± | 0.19 | 1.95 ± | 0.14 | 10.07 ± | 0.71 |
| Upper Facial Height ... ... . | 74 | 51 | 63.65 ± | 0.43 | 4.31 ± | 0.30 | 6.77 ± | 0.47 |
| Morph. Facial Height ... ... ... | 123 | 98 | 110.06 ± | 0.62 | 6.22 ± | 0.44 | 5.65 ± | 0.40 |
| Hori. Circum. of Head ... ... ... | 570 | 500 | 538.08 ± | 1.50 | 15.10 ± | 1.06 | 2.81 ± | 0.20 |
| Trans. Arc of Head ... ... ... | 351 | 302 | 330.92 ± | 1.15 | 11.54 ± | 0.81 | 3.49 ± | 0.25 |

## TABLE 21

### STATISTICAL CONSTANTS OF THE INDICES

| Indices | Maximum | Minimum | Mean ± S. E. | S. D. ± S. E. | C. V. ± S. E. |
|---|---|---|---|---|---|
| Length-Breadth ... | 85.63 | 71.35 | 77.36 0.30 | 3.04 0.21 | 3.93 ± 0.28 |
| Length-Height ... ... | 74.27 | 58.73 | 64.81 0.27 | 2.76 0.19 | 4.26 ± 0.30 |
| Breadth-Height ... ... | 93.41 | 74.83 | 83.76 0.34 | 3.48 0.24 | 4.15 ± 0.29 |
| Nasal ... ... | 88.37 | 58.93 | 74.01 0.64 | 6.45 0.45 | 8.72 ± 0.61 |
| Morphological Facial ... | 93.80 | 72.59 | 82.97 0.45 | 4.50 0.32 | 5.42 ± 0.38 |
| Jugo-Frontal ... ... | 83.33 | 66.90 | 75.99 0.29 | 2.93 0.21 | 3.86 ± 0.27 |
| Jugo-Mandibular ... | 85.50 | 62.68 | 74.88 0.33 | 3.33 0.23 | 4.45 ± 0.31 |

## MORPHOLOGICAL OBSERVATION

### TABLE 22

#### SKIN COLOUR

| Forehead | f | % |
|---|---|---|
| Black brown ... | 11 | 10.78 |
| Dark brown ... | 33 | 32.35 |
| Clear brown ... | 51 | 50.00 |
| Bright tawny ... | 7 | 6.86 |
| | 102 | 99.99 |

### TABLE 23

#### HAIR

| Colour, Head | f | % |
|---|---|---|
| Black ... | 55 | 53.92 |
| Brownish black ... | 47 | 46.06 |
| | 102 | 99.98 |

| Form | f | % |
|---|---|---|
| Flat with slight waves | 49 | 48.51 |
| Broad waves | 31 | 30.69 |
| Narrow waves | | 20.79 |
| | 101 | 99.99 |

| Hair Quantity, Head | f | % |
|---|---|---|
| Scanty | 4 | 3.92 |
| Medium | 32 | 31.37 |
| Pronounced | 66 | 64.71 |
| | 102 | 00.00 |

### TABLE 24

#### EYE

| Colour | f | % |
|---|---|---|
| Dark blue ... | 2 | 1.96 |
| Brown green ... | 1 | 0.98 |
| Clear brown ... | 2 | 1.96 |
| Roe brown ... | 8 | 7.84 |
| Brown ... | 23 | 22.55 |
| Dark brown ... | 29 | 28.43 |
| Deep dark brown ... | 20 | 19.61 |
| Black brown ... | 17 | 16.67 |
| | 102 | 100.00 |

### TABLE 25

#### NOSE

| Profile | f | |
|---|---|---|
| Concave ... | 11 | 10.78 |
| Straight ... | 83 | 81.37 |
| Convex ... | 8 | 7.84 |
| | 102 | 99.99 |

| Depression | | % |
|---|---|---|
| None | 32 | 31.37 |
| Shallow | 65 | 63.73 |
| Deep | 5 | 4.90 |
| | 102 | 100.00 |

### TABLE 26

#### FOREHEAD

| Height | f | |
|---|---|---|
| Low ... | 21 | 20.59 |
| Medium ... | 74 | 72.55 |
| High ... | 7 | 6.86 |
| | 102 | 100.00 |

### TABLE 27

#### BROWRIDGES

| Development | f | % |
|---|---|---|
| Absent ... | 46 | 45.10 |
| Submedium ... | 18 | 17.65 |
| Medium ... | 36 | 35.29 |
| Prominent ... | 2 | 1.96 |
| | 102 | 100.00 |

### TABLE 28

#### LIPS

| Thickness | f | % |
|---|---|---|
| Thin ... | 30 | 30.00 |
| Medium ... | 61 | 61.00 |
| Thick ... | 9 | 9.00 |
| | 100 | 100.00 |

TABLE 29

CHIN

| Prominence | | f | % |
|---|---|---|---|
| Positive | ... | 25 | 24.51 |
| Neutral | ... | 34 | 33.33 |
| Negative | ... | 43 | 42.16 |
| | | 102 | 100.00 |

TABLE 30

FACE

| Form | | f | % |
|---|---|---|---|
| Elliptical | ... | 19 | 18.63 |
| Oval | ... | 38 | 37.26 |
| Round | ... | 2 | 1.96 |
| Rectangular | ... | 6 | 5.88 |
| Squarish | ... | 37 | 36.27 |
| | | 102 | 100.00 |

*Skin (table 22)*

On the forehead skin colour is clear brown in half of the population investigated and dark brown among one-third of them. Black brown nuance occurs in 11 cases (10.78%) and bright tawny in 7 cases (6.86%) only.

*Hair (table 23)*

The colour of the head hair appears black in 53.92% and brownish black in 46.06%. Flat wavy hair predominates (48.51%), although 30.69% have broad waves and 20.79% narrow waves. The quantity of the head hair is pronounced in 64.71% and medium in 31.37%.

*Eye (table 24)*

Dark brown colour predominates (28.43%) although brown, deep dark brown and black brown show frequencies of 22.55%, 19.61% and 16.67% respectively.

*Nose (table 25)*

In nasal profile, majority (81.37%) has straight nose with 10.78% concave and 7.84% convex profile.

Depression at the nasion is shallow in 63.73% cases and absent in 31.37%, while it is deep in only 5 individuals (4.90%).

*Forehead and Browridges (table 26)*

Although height of the forehead is mainly medium (27.55%), it is low in 20.59% and high in 6.86%. Browridges are medium in 53% (including sub-medium class) and prominent in 2 individuals only. Among the rest it is absent.

*Lips (table 28)*

Lips are medium in 61% people and thick in 9%. It is noteworthy that in 30% individuals lips are thin.

*Chin (table 29)*

Prominence of the chin is negetive in 42.16%, positive in 24.51% and neutral among the rest.

*Face (table 30)*

Form of the face is oval in 37.26% of the population, nearly as often occurs the squarish type, elliptical in half of the people representing the oval. Frequencies of 5.88% and 1.96% are represented by rectangular type and round type respectively.

## COMPARISON WITH THURSTON'S DATA:

The only somatometric data of the Madiga available for comparison are that of Thurston (1909) who measured them from the districts of Kurnool (Adoni) and Bellery (Hospet) of Andhra State. In the following table Thurston's data have been compared with the present series.

TABLE 31

IVE TABLE SHOWING THURSTON'S DATA AND THE PRESENT SERIES

| Characters | Thurston (Kurnool dist.) N = 30 | | | Thurston (Bellery dist.) N = 40 | | | Present Study (Guntur dist.) N = 102 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Av. | Min. | Max. | Av. | Min. | Max. | Av. |
| Stature | 1542 | 1732 | 1631 | 1522 | 1731 | 1629 | 1452 | 1777 | 1619.52 |
| Head-length | 170 | 202 | 186 | 172 | 200 | 183 | 169 | 195 | 183.70 |
| Head-breadth | 130 | 146 | 139 | 130 | 154 | 140 | 129 | 155 | 141.99 |
| Cephalic-index | 71.3 | 82.2 | 75.0 | 68.0 | 83.3 | 76.5 | 71.35 | 85.63 | 77.33 |
| Nasal-index | 69.4 | 102.6 | 80.6 | 66.7 | 90.1 | 77.5 | 58.93 | 88.37 | 74.01 |

It appears from the above table that the data from Bellery district approach the present series of Guntur district more closely than that of Kurnool district. A difference of 1 cm or so in stature noticeable between Thurston's series and the present one is not remarkable. It is evident that the present series shows an increase of less than 1 unit in cephalic index from that of Bellery data and more than 2 units from Kurnool data. This might be either due to, besides sample sizes, the local character of the population or relative increase of head breadth in proportion to head length during the last half-a-century. It is apparent from the above table that whereas the head length of present series does not differ, the head breadth increases by 2 mm from those of Bellery district.

When compared with Kurnool data the present series decreases by 2.30 mm in head length and increases by 2 mm in head breadth. From both the series of Thurston, therefore, the present sample increases in head breadth, which might be held responsible for the tendency towards rounder head-forms of the Madiga of the present series. The maximum value for head breadth is also attained by the present series. Nasal index is lowest (74.01) in Guntur and highest )80.6) in Kurnool, the Bellary series standing intermediate (77.5). The difference between Thurston's data and the present series is difficult to interpret but it might be due to measuring technique specially in location of nasion. The difference of Thurston's two samples may be local variation.

By forming a smaller endogamous unit within the bigger caste organization, whether the Christian Madiga, preserving rigidly caste endogamy, are varying from the rest of the Madiga, is a problem for investigation.

In the present series the high values of coefficient of variation of the measurements and indices pertaining to nose i.e. nasal depth, interorbital breadth, nasal breadth, nasal height and nasal index is conspicuous.

**SUMMARY**

*Somatometric measurements on 102 adult male Madiga, an untouchable caste of Andhra, were taken during January-April 1960 from Palnad taluq of district Guntur.*

*Regarding their metric characters, the Madiga are mainly mesocephal (46%) and dolichocephal (39%, while 14% brachycephal are present among them. They are highly hypsicephalic (78%) but none is chamaecephalic. In stature, they are in majority short, below medium and medium, whereas 11% of the population is tall. They are euryprosop in 41%, mesoprosop in 25% and hypereuryprosop in 20% population. Mainly they have mesorrhine (72%) nose but leptorrhine is not infrequent (22%).*

*In non-metric characters they are clear brown and dark brown in skin colour, black in hair colour and brown in eye colour. Hair is wavy and face is oval and elliptical.*

*When the present series is compared with Thurston's data, the only previous somatometric record of the Madiga, an increase in head breadth is noticed in the present series, which is reflected in their rounder head forms. In nasal index too, there is slight variation among the two series.*

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# THE MAHARS OF MAHARASHTRA : AN ANTHROPOMETRIC APPRAISAL

HIRENDRA K. RAKSHIT

I ABOUT THE PEOPLE.
II ANTHROPOMETRIC RESULTS OF THE MAHARS OF NAGPUR.
III EARLIER ANTHROPOMETRIC STUDIES OF THE MAHARS.
IV THE MAHARS OF MAHARASHTRA AND THE PEOPLE OF EQUIVALENT CASTE STATUS IN OTHER REGIONS OF INDIA.

## I

The Mahars (Mahras, Maras, Maharas, Mars, Mehras) are an interesting set of people inhabiting largely all the districts of Maharashtra. Most of them speak in Marathi and the caste is typical of Maharashtra. However, the Mahars overflow in some of the adjoining linguistic areas and are to be found in some districts of Mysore and Andhra States in the south, Gujarat and lower districts of Madhya Pradesh in the north and also in the south-eastern districts of Madhya Pradesh in the east, including some tribal areas, viz., Bastar[1]. As is evident, their distribution is wide with the core of population in Maharashtra. They number in millions and are one of the three most important elements of Maharashtrian population and politics (Patterson, 1954 ; Srinivas, 1957).

The Mahars are the bulk of the untouchable Hindus of the Deccan. Their position in Hindu caste heirarchy is proverbially low. Truly speaking, the Mahars are only marginal Hindus and being oppressed by all other castes higher than theirs, they can switch over to any other religion to establish their human and political rights. There are many an instance when the Mahars have embraced Islam or Christianity *en block*. Of late, there has been a mass conversion of the Mahars of Maharashtra to Buddhism.

In the Deccan, the Mahars occupy a unique position in the village (Wilson, 1857 ; Gooddine ; Sinclair, 1874 ; Oppert, 1894 ; Russell and Hira Lal, 1916 ; Enthoven, 1922 ; Robertson, 1930). They are the traditional village headmen occasionally settling boundary disputes. Their obligatory participation in some capacity or the other in marriage, death and religious ceremonies of even other castes of the village necessarily speaks of their importance in the village life of the Deccan. But they have got their menial jobs too to do. They take away the dead animals from the village. Traditionally, they are the village drumers. At least, a considerable section of the Mahars is traditionally attached also to weaving, supplying part of the annual requirement of the village.

The Mahars seem to be a very early settlers of the Deccan as reflected through their conventional rights and privileges, the former often sanctioned by the ruling authority, specially the Mughols.

The Pandharpur tradition of the Mahars is very interesting and from this community of the region has come number of saints-cum-devotional poets enriching medieval religious movement (13th century), as also enriching the Marathi language.

Some of the traditional customs of the Mahars, as noted by Sherring (1879), Russell and Hiral Lal (1916), Enthoven (1922), Robertson (1938), and also noticed by the writer and his associates, may be summarized in the following lines. They practise cross-cousin marriage and still retain the kinship terminology to the same effect. Widow marriage is allowed and junior levirate not uncommon. The community is divided into a large number of endogamous groups and each endogamous group is divided into a number of exogamous units, the latter reminescent of clan organization with specific totems (Devak). Taking beef is not traditionally prohibited. The deads are usually buried.

The Mahars being very numerous and distributed in a wide area, all the customs noted above

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may not be practised in all the regions due to their differential contact with the borrowing from other cultures and traditions.

Earlier writers like Wilson (1857 : XXII), Sinclair (1875 : 130-131), Oppert (1894 : 21-22), Russell and Hira Lal (1916 : 129-130) are inclined to derive the name Maharashtra from the Mahars, viz., the land of the Mahars or Mahar (r) ashtra[2]. Enthoven (1922 : 401) considers them to be originally a tribe or rather a confederation of tribes, their present counterparts being the Kolis, Bois, Katkaries, Ramoshis and the Vedars. And Robertson (1938 : 54) observes some Mahar surnames which are also to be found among the Katkaries, a primitive tribe of Western Ghats.

## II

This part of the note is based on the study of the Mahars residing in Nagpur city and Kamptee town, the latter about 10 miles east of Nagpur city. The investigation was carried out by the writer during June-September, 1958. Present residential origin of the subjects measured has been indicated below. The sample includes measurements and observations on 150 adult males[3].

TABLE 1

| Residential Origin | | No. of subjects measured |
|---|---|---|
| Nagpur City (i) | Ambedkar Town, Dharampeth | 66 |
| (ii) | Indora | 25 |
| Kamptee Town | | 59 |
| | Total | 150 |

### (A) SOMATOSCOPIC TRAITS

**Skin Colour**: The results (Table 2) are based on the visual impression of the colour in forehead and cheek region of the subjects. The brown coloured peoples are in clear majority (60.0%), followed by the people of darker shades (27.0%). It is interesting to note that 11.3% show yellowish tinge either with brown or black base. It should, however, be made clear that the presence of yellowish tinge should not be taken as an evidence for mongoloid admixture unless otherwise proved. One case only shows marked degree of yellowishness having distinct pale yellowish skin colour.

TABLE 2

**Skin Colour (% Frequency). N 150**

| | | | |
|---|---|---|---|
| Dark | Black | 3.3 | |
| | Chocolate | 24.7 | 28.0 |
| Brown | Dark | 40.0 | |
| | Medium | 7.3 | |
| | Light | 12.7 | 60.0 |
| Yellowish | Brown | 6.0 | |
| | Dark | 5.3 | 11.3 |
| Fair | | | 0.7 |

**Head hair** of the Mahars examined (Table 3a) are mostly straight (63.6%), others wavy (32.8%) and very infrequently curly (3.4%). The texture of the hair has been found to be mostly either medium or coarse.

**Body hair** quantity has been observed on the forearm only. The majority of the Mahars exhibit scanty hair growth (Table 3b).

TABLE 3

**Hair (% Frequency)**

**(a) On Head**

| Form. N = 146 | | | Texture. N = 141 | |
|---|---|---|---|---|
| Straight | | 63.6 | Thin | 19.1 |
| Wavy | Long | 16.4 | | |
| | Medium | 9.6 | Medium | 45.4 |
| | Deep | 6.8 | | |
| Curly | | 3.4 | Thick | 35.5 |

**(b) On Body**

**Quantity. N = 150**

| | | | |
|---|---|---|---|
| Very scanty | 6.0 | Medium | 34.0 |
| Scanty | 51.3 | Profuse | 8.7 |

**Forehead** of the Mahars are only rarely high. Low foreheads are common. On the contrary, broad foreheads are not uncommon and narrow foreheads rare. Foreheads are mostly straight or having slight backward slope (Table 4).

TABLE 4

**Forehead (% Frequency). N = 150**

| Height | | Breadth | | Slope | |
|---|---|---|---|---|---|
| High | 10.0 | Broad | 26.7 | Straight | 44.7 |
| | | | | Slight | 25.3 |
| Medium | 61.3 | Medium | 60.0 | Slope Medium | 28.0 |
| | | | | Marked | 2.0 |
| Low | 28.7 | Narrow | 13.3 | | |

**Supraorbital ridges** of the Mahars are, in general, of moderate prominance though smooth ridges are also quite common. Absence of marked ridges in any of the persons is noteworthy (Table 5).

TABLE 5

| Supraorbital Ridges (% Frequency). N | 150 |
|---|---|
| Not prominent | 36.7 |
| Slight | 11.3 |
| Moderate | 40.0 |
| Moderate† | 12.0 |
| Marked | 0.0 |

**Eye**: Oblique eye is practically absent among the Mahars. Only in one case slight obliquity has been observed. Epicanthic fold has not been observed in any of the individuals.

**Nose**: Medium depression of the nasal root is most common, though shallow depression is not wanting. Presence of deep depression has been observed among 17.3%. Nasal septum is mostly directed upward. Persons with horizontal septum are also quite frequent. Thick nasal tip is quite common (22.9%), and bulbous tip has also been observed among 4.9% of the sample. So far the nasal bridge is concerned straight one is by far the most common. Concave bridge, indicative of primitiveness, has also been observed quite frequently (24.7%). Convex bridge, however, is not altogether infrequent (12.7%).

TABLE 6

Nose (% Frequency)

| Depression of the Root N = 150 | | Septum N = 150 | |
|---|---|---|---|
| Deep | 17.3 | Upward, slight | 6.0 |
| Medium | 52.0 | Upward | 44.7 |
| Shallow | 30.7 | Horizontal | 41.3 |
| | | Downward | 8.0 |

| Tip N = 144 | | Bridge N = 150 | |
|---|---|---|---|
| Thin | 9.0 | Concave | 24.7 |
| Medium | 63.2 | Straight | 40.0 |
| Thick | 22.9 | Convex | 12.7 |
| Bulbous | 4.9 | Mixed | |

**Lip**: Persons with medium thick lip are common, though thin lip is also to be met with. Thick lip is very infrequent. Only a very few cases show eversion of the lip (Table 7).

TABLE 7

Lip (% Frequency). N = 150

| Form | | Eversion | |
|---|---|---|---|
| Thin | 24.0 | Not everted | 98.0 |
| Medium | 72.0 | Everted, slight | 1.3 |
| Thick | 4.0 | Everted, medium | 0.7 |
| Very thick | 0.0 | | |

**Chin** of the Mahars are mostly round. Oval and square chins are also frequent. Pointed chin is practically absent among them. Rudimentary chin is quite common (19.0%), as also the prominent chin (24.1%) (Table 8a).

**Alveolar prognathism**, in marked degree, has not been observed among any of the Mahars. Some of them (24.7%) show slight prognathism and only 6% show prognathism in moderate degree (Table 8b).

TABLE 8

(a) Chin
(% Frequency)

| Form N = 149 | | Size N = 58 | |
|---|---|---|---|
| Square | 19.5 | Prominent | 24.1 |
| Oval | 26.2 | Moderate | 53.4 |
| Round | 53.7 | Small | 3.4 |
| Pointed | 0.7 | Rudimentary | 19.0 |

(b) Alveolar Prognathism
(% Frequency)

N = 150

| | | | |
|---|---|---|---|
| Absent | 69.3 | Moderate | 6.0 |
| Slight | 24.7 | Marked | 0.0 |

**Face type**: The most frequent types are the reversed trapezoid (26.0%), pentangular (19.3%), oval (16.0%) and rhomboid (13.3%). It may be noted that the longish face (elliptical, oval, reversed oval and rhomboid) constitutes as high as 43.3% of the sample.

TABLE 9

Face type (% Frequency). N – 150

| | | | |
|---|---|---|---|
| Elliptical | 8.0 | Squarish | 3.3 |
| Oval | 16.0 | Rhomboid | 13.3 |
| Reversed oval | 6.0 | Trapezoid | 2.7 |
| Round | 5.3 | Reversed Trapezoid | 26.0 |
| Rectangular | 0.0 | Pentangular | 19.3 |

**(B) DIRECT MEASUREMENTS**

Altogether 19 linear and curvilinear measurements have been taken on each subject. The mean values of these measurements along with other statistical constants are shown in Table 10.

**(C) INDICES**

Fourteen indices, based on above 19 direct measurements, have been computed and the mean values along with other statistical constants are noted in Table 11.

TABLE 10

Statistical Constants of Direct Measurements[4] in mm.
N = 150

| Character | Mean | s. e. | S. D. | | C. V. | s. e. | Min.-Max. |
|---|---|---|---|---|---|---|---|
| St | 1606.95 | 4.583 | 56.14 | 3.241 | 3.49 | 0.202 | 1430 - 1741 |
| SH | 832.39 | 2.395 | 29.34 | 1.694 | 3.52 | 0.203 | 736 - 928 |
| HL | 181.92 | 0.502 | 6.15 | 0.355 | 3.38 | 0.195 | 170 - 201 |
| HB | 139.12 | 0.493 | 6.04 | 0.345 | 4.33 | 0.250 | 131 - 153 |
| AH | 113.40 | 0.463 | 5.67 | 0.327 | 5.00 | 0.290 | 102 - 127 |
| FB | 99.83 | 0.443 | 5.43 | 0.314 | 5.43 | 0.316 | 84 - 112 |
| BzB | 131.49 | 0.177 | 5.84 | 0.337 | 4.44 | 0.256 | 110 - 144 |
| BB | 100.99 | 0.485 | 5.95 | 0.343 | 5.89 | 0.341 | 88 - 113 |
| IOB | 31.11 | 0.194 | 2.38 | 0.137 | 7.64 | 0.444 | 26 - 113 |
| ONB | 97.13 | 0.308 | 3.78 | 0.218 | 3.89 | 0.225 | 91 - 109 |
| ONA | 108.37 | 0.439 | 5.37 | 0.310 | 4.96 | 0.287 | 99 - 122 |
| NH | 46.31 | 0.245 | 3.00 | 0.173 | 6.48 | 0.376 | 40 - 54 |
| NB | 35.97 | 0.233 | 2.86 | 0.165 | 7.95 | 0.462 | 25 - 44 |
| ND | 20.27 | 0.201 | 2.46 | 0.142 | 12.15 | 0.711 | 15 - 27 |
| UFH | 61.51 | 0.327 | 4.01 | 0.232 | 6.52 | 0.378 | 52 - 72 |
| TFH | 106.99 | 0.522 | 6.40 | 0.369 | 5.98 | 0.346 | 94 - 129 |
| HC | 521.30 | 1.178 | 14.43 | 0.833 | 2.77 | 0.160 | 482 - 556 |
| SA | 330.48 | 1.226 | 15.01 | 0.867 | 4.54 | 0.263 | 301 - 398 |
| TA | 323.55 | 0.999 | 12.24 | 0.707 | 3.78 | 0.218 | 291 - 350 |

TABLE 11

Statistical Constants of Indices[4]
N = 150

| Index | Mean | s. e. | S. D. | s. e. | C. V. | | Min.-Max. |
|---|---|---|---|---|---|---|---|
| CI | 76.71 | 0.295 | 3.61 | 0.208 | 4.70 | 0.273 | 68.39 - 88.95 |
| LHI | 62.37 | 0.244 | 2.99 | 0.173 | 4.80 | 0.278 | 53.48 - 71.43 |
| BHI | 81.38 | 0.353 | 4.33 | 0.250 | 5.32 | 0.309 | 71.43 - 93.18 |
| NI | 77.97 | 0.643 | 7.87 | 0.454 | 10.09 | 0.595 | 61.54 - 95.65 |
| NEI | 56.73 | 0.690 | 8.45 | 0.488 | 14.89 | 0.898 | 40.54 - 79.41 |
| ONI | 111.57 | 0.273 | 3.34 | 0.193 | 3.00 | 0.173 | 105.21 - 121.21 |
| TFPI | 71.62 | 0.303 | 3.77 | 0.218 | 5.27 | 0.306 | 63.95 - 95.62 |
| UFI | 46.82 | 0.258 | 3.16 | 0.183 | 6.76 | 0.394 | 39.13 - 54.47 |
| TFI | 81.42 | 0.381 | 4.67 | 0.270 | 5.73 | 0.333 | 72.39 - 95.31 |
| TCFI | 94.33 | 0.296 | 3.62 | 0.209 | 3.84 | 0.223 | 81.48 - 103.03 |
| VCFI | 94.49 | 0.494 | 6.05 | 0.349 | 6.40 | 0.372 | 83.62 - 111.21 |
| ZFI | 75.97 | 0.308 | 3.77 | 0.218 | 4.97 | 0.288 | 65.62 - 100.77 |
| ZMI | 76.86 | 0.346 | 4.24 | 0.245 | 5.52 | 0.321 | 64.18 - 86.51 |
| SSI | 51.81 | 0.087 | 1.07 | 0.062 | 2.07 | 0.119 | 48.67 - 54.01 |

**(D) CLASSIFICATION TABLES**

**Stature (St.)**: As already noted, the mean stature of the Mahars is 1606.95 mm making them a people of below medium stature as a group. Short statured persons comprise as high as 42.7% of the sample in contrast to only 4.7% tall individuals.

TABLE 12

**Classification : Stature**
**N = 150**

| Class | Range in mm | % Frequency |
|---|---|---|
| Very short | 1300 — 1499 | 3.3 |
| Short | 1500 — 1599 | 42.7 |
| Below Medium | 1600 — 1639 | 26.0 |
| Medium | 1640 — 1669 | 14.7 |
| Above medium | 1670 — 1699 | 8.7 |
| Tall | 1700 — 1799 | 4.7 |

**Cephalic Index (C. I.)**: The mean cephalic index of the group is 76.74. Classification table shows that the Mahars are mostly delicho- to mesocephalic people, comprising 86% of the sample. The brachycephalic element though present, is not of much quantitative importance.

TABLE 13

**Classification : Cephalic Index**
**N 150**

| Class | Range | % Frequency |
|---|---|---|
| Hyperdolichocephal | below — 70.9 | 2.7 |
| Dolichocephal | 71.0 — 75.9 | 41.0 |
| Mesocephal | 76.0 — 80.9 | 42.0 |
| Brachycephal | 81.0 — 85.4 | 9.3 |
| Hyperbrachycephal | 85.5 — above | 2.0 |

**Nasal Index (N. I.)**: The mean nasal index of the Mahars under study is 77.97. Contrary to Risley's findings they show 13.3% of leptorrhine nose. The predominant element is the mesorrhine nose.

TABLE 14

**Classification : Nasal Index**
**N = 150**

| Class | Range | % Frequency |
|---|---|---|
| Hyperleptorrhine | below — 54.9 | 0.0 |
| Leptorrhine | 55.0 — 69.9 | 13.3 |
| Mesorrhine | 70.0 — 84.9 | 70.0 |
| Chamaerrhine | 85.0 — 99.9 | 16.7 |
| Hyperchamaerrhine | 100.0 — above | 0.0 |

**Total Facial Index (T. F. I.)**: The mean index is 81.42. Hypereuryprosops and euryprosops are almost equally common and together include 72.0% of the sample.

TABLE 15

**Classification : Total Facial Index**

| Class | Range | % Frequency |
|---|---|---|
| Hypereuryprosop | below — 78.9 | 33.3 |
| Euryprosop | 79.0 — 83.9 | 38.7 |
| Mesoprosop | 84.0 — 87.9 | 18.0 |
| Leptoprosop | 88.0 — 92.9 | 9.3 |
| Hyperleptoprosop | 93.0 — above | 0.7 |

The Mahars of the present study are predominantly short (46.0%) to below medium (26.0%) in stature, dolicho-(44.0%) to mesocephalic (42.0%) in head shape, mesorrhine (70.0%) in nose shape with hypereuryprosop (33.3%) to euryprosop (38.7%) face.

III

In this part of the paper the findings of the present study have been compared with those of earlier studies on the Mahars by Risley (1907) and Karve and Dandekar (1951). Table 16 has been prepared on available data.

The mean values of at least seven measurements (AH, NH, UFH, TFH, HC, SA and TA) given by Karve and Dandekar (1951) for Mahars are not possibly comparable. In rest of the ten direct measurements present series resembles the Bawane Mahar series most closely excepting in St, ONB and ONA. Either the present series or the Bawane Mahar series shows smaller absolute dimensions in all the ten characters while Des group exhibits largest absolute dimensions in at least seven characters. In stature, Risley's group is the tallest. The mean NB of Risley's group is conspicuously large compared to other three groups.

Incorrectness of some of the direct measurements given by Karve and Dandekar is not so much telling upon the values of indices excepting in cases when AH is involved. All the groups agree closely in almost all the indices excepting (i) NI of Risley's group, which shows higher value and (ii) between groups large variations of LHI, BHI and VCFI are evidently due to the involvement of AH in these indices.

TABLE 16

**Mahar Anthropometric Data Compared**

**Mean Values**

| Author | Risley | Karve & Dandekar | Karve & Dandekar | Present Study |
|---|---|---|---|---|
| Sample size | 100 | 102 | 25 | 150 |
| Region | Poona & adjoining districts | Des, Godavari-Krishna basin | Purna valley & Nagpur Region (Bawane Mahars only) | Nagpur |
| **Characters** | | | | |
| St | 1634 | 1622.00 | 1584.16 | 1606.95 |
| HL | 181.6 | 183.66 | 183.24 | 181.92 |
| HB | 140.0 | 143.20 | 140.20 | 139.42 |
| AH | — | 135.71 | 131.40 | 113.40 |
| FB | — | 104.72 | 102.40 | 99.83 |
| BzB | — | 134.50 | 132.64 | 131.49 |
| BB | — | 105.19 | 101.60 | 100.99 |
| IOB | — | 30.50 | 30.04 | 31.11 |
| ONB | — | 93.00 | 90.96 | 97.13 |
| ONA | — | 106.64 | 102.32 | 108.37 |
| NH | 47.2 | 45.57 | 46.08 | 46.31 |
| NB | 38.7 | 36.24 | 35.48 | 35.97 |
| UFH | — | 59.60 | 59.84 | 61.51 |
| TFH | — | 108.69 | 109.24 | 106.99 |
| HC | — | 533.11 | 525.16 | 521.30 |
| SA | — | 355.38 | 346.20 | 330.48 |
| TA | — | 349.31 | 338.20 | 323.55 |
| **Indices** | | | | |
| CI | 77.0 | 77.97 | 76.51 | 76.74 |
| LHI | — | 73.89 | 71.71 | 62.37 |
| BHI | — | 94.77 | 93.72 | 81.38 |
| NI | 81.9 | 79.52 | 76.99 | 77.97 |
| ONI | — | 114.66 | 112.49 | 111.57 |
| TFPI | — | 73.13 | 73.03 | 71.62 |
| UFI | — | 44.31 | 45.11 | 46.82 |
| TFI | — | 80.81 | 82.36 | 81.42 |
| TCFI | — | 93.92 | 94.60 | 94.33 |
| VCFI | — | 80.09 | 83.[illegible] | 94.49 |
| ZFI | — | 77.86 | 77.20 | 75.97 |
| ZMI | — | 78.21 | 76.60 | 76.86 |

## IV

It is intended, in this part of the note, to compare Mahar anthropometric data with the published anthropometric data on their parallels in the caste hierarchy of other regions.

### (A) SELECTED CHARACTERS AND INDICES

Firstly, comparison has been based on few selected characters and indices which are of more use for racial study. The mean values of five direct measurements and two indices for different castes are presented in Appendix Table A.

**Nasal Index**: It appears from the table that the nasal index of the groups adopted from Risley shows considerably higher index than those adopted from other authors. The authorwise scrutiny of the material in respect of different characters brings out the fact clearly that the groups of Risley differ from other authors in respect of NH, NB and NI (but not St, HL, HB and CI). To be more precise, Risley's groups, in general, exhibit larger mean NB but smaller mean NH and higher NI compared to the groups of other investigators.

TABLE 17

**AUTHORWISE ANALYSIS**

**(i) Mean Nasal Index**
**34 groups[5]**

| Class | Risley | Other Investigators | Total |
|---|---|---|---|
| X — 69.9 | | 1 | 1 |
| 70.0 — 74.9 | | 7 | 8 |
| 75.0 — 79.9 | | 12 | 14 |
| 80.0 — 84.9 | 6 | 2 | 8 |
| 85.0 — X | 3 | — | 3 |
| Total | 12 | 22 | 34 |

**(ii) Mean Nasal Height**
**29 groups[6]**

| Dimension in mm | Risley | Other Investigators | Total |
|---|---|---|---|
| 41—47 | 8 | 4 | 12 |
| 48—49 | 3 | 6 | 9 |
| 50—52 | 1 | 7 | 8 |
| Total | 12 | 17 | 29 |

**(iii) Mean Nasal Breadth**
**29 groups**

| Dimention in mm | Risley | Other Investigators | Total |
|---|---|---|---|
| 34—36 | 1 | | 10 |
| 37 | 3 | | 10 |
| 38—40 | 8 | 1 | 9 |
| Total | 12 | 17 | 29 |

It is clear enough from Table 17 that the higher indices (NI) for Risley's groups are mostly due to larger values of NB and to a certain extent smaller values of NH. This telling discrepancy may be ascribed to any one or more of the reasons noted below.

(1) Excepting one Risley's all other groups belong to either Bengal, Bihar or U.P., i.e. a contiguous tract along the courses of the Ganges. So the higher values of NI (along with larger NB and smaller NH) recorded by Risley might be reflecting the possession of broader nose by the lower castes of this region in contrast to other regions.

(2) Since Risley (through his assistants) has measured, these people might significantly have lowered their NI (as a consequence of their decreased NB and increased NH) through admixture with narrower nosed people or through some other genetic or even environmental cause.

(3) There is a popular notion among the Indian anthropologists that Risley's data contain error due partly to the method of sampling employed by him (Guha, 1935 : ii; Chattopadhyay, 1953 : 365). Moreover, the technique of measuring the nasal height (NH) by Risley's investigators has also been specifically questioned (Guha, 1935 : iii). Present finding, however, only coroborates such apprehension in respect of NB, NH and NI.

The first alternative seems, however, highly improbable unless we accept the second alternative as well. For, other investigators have worked subsequently in U. P. (Mazumdar) and Bengal (Majumdar, Chakladar and Raychaudhuri) among different castes in question and their results do not corroborate Risley's findings. The second alternative, on the assumption that the population concerned has undergone a radical change in the three characters during a period of about 50 years or even less (Table 18) does not seem very convincing.

TABLE 18

**Approximate Period of Investigation**
**34 groups**

| Calendar year | No. of groups included | Investigator |
|---|---|---|
| (1) | (2) | (3) |
| 1891—? | 12 | Risley |
| 1900—1907 | 5 | Thurston |
| 1930—1939 | 2 | Chakladar & Guha |
| 1940—1949 | 11 | Mazumdar & Karve |
| 1950—1960 | 4 | Raychaudhuri & Rakshit |

One is rather tempted to conclude that if not exclusively, at least, largely the third factor is responsible for such a large discrepancy.

Stature of different untouchable castes under consideration does not show any definite trend in favour of variation due to region. Though it might be suspected that the Gujarat-Maharashtra group possesses slightly lower stature compared to Bengal and specially Bihar—U. P. group. Table 19 shows the group frequency of mean stature by region.

TABLE 19

**Mean Stature : Frequency by Region**
**34 groups**

| Class in mm. | South India | Gujrat-Maharashrta | Bengal | Bihar-U.P. | Total |
|---|---|---|---|---|---|
| 1500—1599 | — | 3 | 4 | 2 | 9 |
| 1600—1639 | 5 | 1 | 9 | 1 | 22 |
| 1640—1669 | — | - | 1 | 2 | 3 |
| Total | 5 | 7 | 14 | 8 | 34 |

**Cephalic Index**, however, shows a distinct regional trend, already observed by earlier writers (Risley 1915, Chanda 1916, Guha 1933 & Sarkar 1955) in respect of general population. Gujarat-Maharashtra-Bengal groups clearly show higher cephalic index in contrast to Bihar—U.P. groups where dolichocephaly is predominant. The South India group, however, stands intermediate and further data are urgently needed from that region to assess the real position of these people. Table 20 below will speak for the regional difference so far the cephalic index is concerned.

TABLE 20

**Mean C. I. : Frequency by Region**
**34 groups**

| Class | South India | Gujrat-Maharashtra-Bengal | Bihar-U.P. | Total |
|---|---|---|---|---|
| 71.0—75.9 | | | | 9 |
| 76.0—76.9 | | | 3 | 9 |
| 77.0—79.9 | | 11 | -- | 16 |
| Total | | 21 | 8 | 34 |

**(B) St-CI-NI**

The analysis of caste groups on the basis of occurrence of different types in respect of St-CI-NI, brings out certain features of comparative interest. But as the analysis requires individual data for St, CI and NI for all the persons measured, only 12 groups could be utilized for the purpose[7]. Any group with smaller sample size has been excluded from the scope of the analysis. A few groups could not be included as the primary data, though published, were not readily available to the present author. The abbreviations and classifications used in this part of the analysis are given below.

| Character | Range | Class | Abbreviation used |
|---|---|---|---|
| | below 1599 | Short | S |
| Stature (in mm) | 1600—1699 | Medium | M (First place) |
| | 1700—above | Tall | T |
| | below—75.9 | Dolichocephal | D |
| Cephalic Index | 76.0—80.9 | Mesocephal | M (Second place) |
| | 81.0—above | Brachycephal | B |
| | below—69.9 | Leptorrhine | L |
| Nasal Index | 70.0—84.9 | Mesorrhine | M (Third place) |
| | 85.0—above | Chamaerrhine | C |

Some of the types occur in all the 12 caste groups belonging to Maharashtra, Uttar Pradesh and Bengal. These types provisionally may be considered as the basic elements so far the untouchable castes of these regions are concerned. The types are as follows:

(1) MDM, (2) MMM, (3) SDM and (4) SMM.

To assess the relative importance of these types following procedure has been adopted. Each type has been given a rank score based on the percentage occurrence in each sample and mean rank has been worked out for different types. The complete table of rank score for all the occurring types has been presented in the Appendix Table B. To assess the quantitative importance, percentage frequency of these types in each group has been worked out and presented in the Appendix Table C. The mean percentage occurrence has also been worked out for comparative purpose. The mean rank score along with mean percentage occurrence (mean percentage coefficient) for four common types in respect of 12 untouchable caste groups are shown in Table 21.

TABLE 21

**Rank Score and % Coefficient**
**Mean based on 12 groups**

| Type | | $\%C_m$ |
|---|---|---|
| MMM | 2.7 | 13.3 |
| MDM | 3.1 | 17.0 |
| SDM | 3.9 | 11.3 |
| SMM | 5.2 | 9.1 |

It is apparent from Appendix Table B that the Muchi group of Chakladar and the Pod group of Raychaudhuri are rather different from the general rank score pattern[8]. Deviation of the Muchi group is especially noteworthy. Excluding this group we arrive at the following values of $R_m$ and $\%C_m$ (Table 21A). In that case MDM type becomes more important, being highest in mean rank position with highest % coefficient.

TABLE 21A

| Type | $R_m$ | $\%C_m$ |
|---|---|---|
| MDM | 2.3 | 17.6 |
| MMM | 2.7 | 13.4 |
| SDM | 3.6 | 11.9 |
| SMM | 5.2 | 9.5 |

In any case these four types together account for about 50% of the sample population taken as a whole. From qualitative point of view the Mahars

and their equivalent caste-groups are lacking in one half in types involving tall stature, brachycephal head and both leptorrhine and chamaerrhine nose.

In order of importance, types which occur at least in 11 groups deserve attention, viz., MBM, MML, MDL and MDC. As none of the types occur in all the 12 groups, computation of $R_m$ is rather difficult for 12 groups. Mean rank score and % coefficient are, therefore, based on 11 groups and shown in Table 22.

TABLE 22

Mean rank score & % coefficient
Based on 11 groups

| Type | $R_m$ | $\%C_m$ |
|---|---|---|
| MBM | 6.5 | 5.8 |
| MML | 7.6 | 5.7 |
| MDL | 8.6 | 4.5 |
| MDC | 9.1 | 3.1 |

These four types do not include tall stature but show the presence of brachycephally, leptorrhiny and chamaerrhiny. It is interesting to note that MBM type is of considerable importance among the caste-groups of Bengal and Maharashtra. But it is not so in case of Uttar Pradesh caste-groups. On the contrary, MDL type is more important for U. P. groups compared to the groups of other regions. MDC type, however, seems to be of general importance irrespective of region. MML type appears to have greater say among the castes of Bengal[11].

Quantitatively the most important physical element pertaining to untouchable castes under consideration is represented by MDM and MMM type (about 30%). These types might be results of admixture between the tribals (Australoid! Veddoid! Pre-Dravidian!) and the Brown race of Elliot Smith (Palaeo-mediterranean of Guha or Dravidian of Haddon). The second element betrays tribal affinity and is represented by such types as SDC, MDC, SDM and SMM (about 25%). Third layer is represented by MDL, MBM and MML. MDL is more important for U. P. castes while MBM is essentially an element of Bengal and Maharashtra. MML type, however, occurs in all the regions though with greater concentration in Bengal. In MDL type we may suspect mediterranean influence while MBM (along with SBM, a type which is consistently present among all the caste-groups of Bengal and Maharashtra in contrast to its absence in U. P.) type may speak for either pareoean or alpine admixture. Lastly, mediterranean and nordic (?) element TDL (TDM, TML, TMM) seem to have some minor influence in U.P., while broadheaded (Dinaric?, TBL, TBM) element has left some trace in Bengal and Maharashtra.

On closer examination of Appendix Table C we find that SDM, MDM, MDL and TDL are relatively more frequent in U.P., while SMM, MMM, MBM and TBL are relatively more important in Bengal and Maharashtra. Type SBM is typical of Bengal and Maharashtra, while TDM is relatively more frequent in U.P.

A schematic representation in a most general way has been attempted in Fig. 1.

**SUMMARY**

*Somatoscopic and somatometric data have been presented for a sample of 150 individuals of Mahar caste of Nagpur and the same have been compared with the data given by Risley and Karve and Dandekar.*

*The untouchable castes measured by the assistants of Risley show slightly smaller nasal height but larger nasal breadth compared to the groups measured by subsequent investigators.*

*The influence of australoid and brown element is unmistakable among the Mahars of Nagpur and other untouchable castes of India. Brachycephal element contributes appreciably to the castes of Bengal and Maharashtra but not of Uttar Pradesh. The most important combination types, based on stature, cephalic index and nasal index, are* MDM, MMM, SDM *and* SMM. *These four types together include about 50% of the sample population and thus one-half of the population lacks any type involving tall stature, brachycephal head and both lepto-and chamaerrhine nose.*

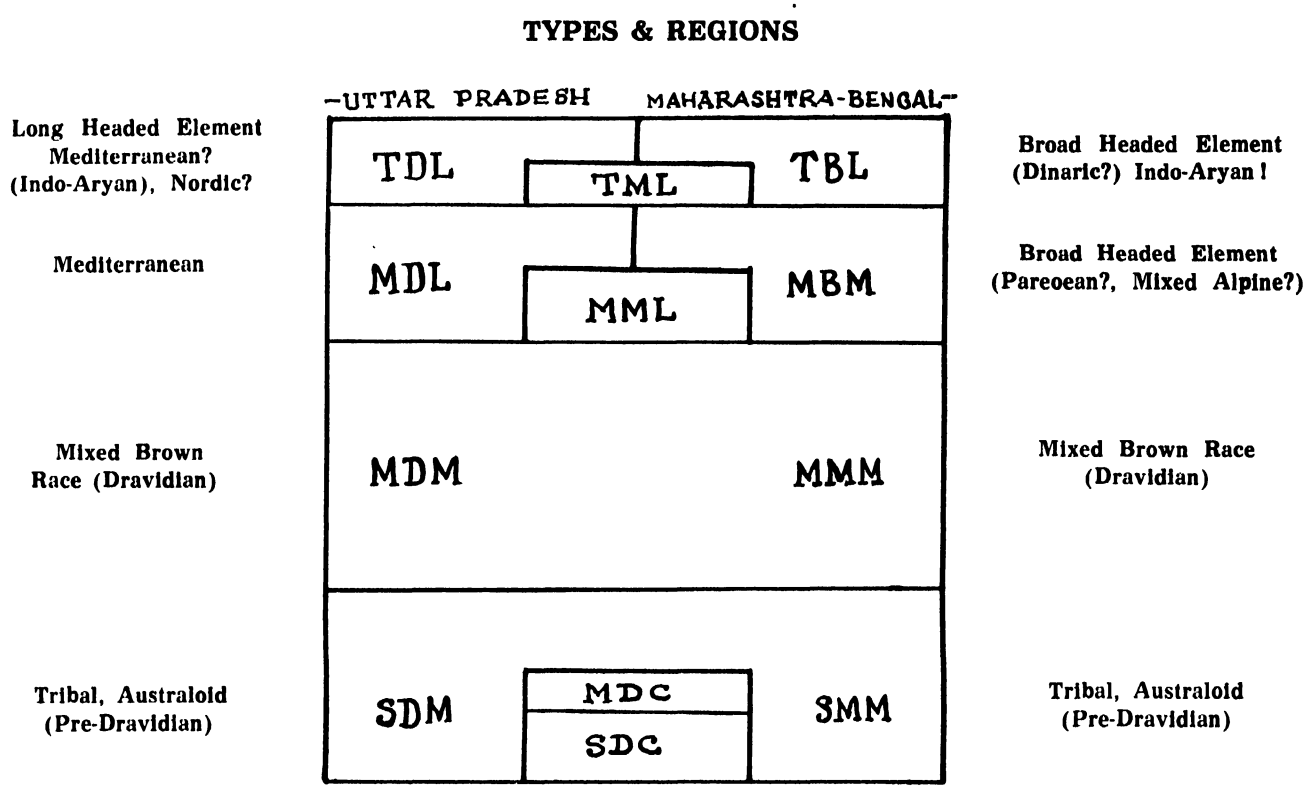


Fig. 1

## NOTES

1. The clan names of the Mahars of Bastar are quite different from those of the Mahars of Maharashtra and the former group rather shows similarity in this respect with the adjoining tribes and Hindu castes of Bastar.

2. Alternatively, Bhandarkar (1957 : 21) has derived the country name from the tribe Maharathi (modern Maratha). Still others following the lead of Molesworth (1857), would find the country name as Maharashtra or the Great country or Kingdom. But this view seems to be of very late innovation and an instance of linguistic mishap. It is interesting to note in this connection that to begin with any religious ceremony the Maharashtrian Brahmanas utter Dandakaranya with the word *desa* or country suffixed instead of Maharashtra (Bhandarkar, 1957 : 11).

3. The age entries of 150 individuals measured are presented below with age class interval of 5 years.

| Age class (in years) | Frequency N = 149 |
|---|---|
| 20 | 2 |
| 21—25 | 63 |
| 26—30 | 30 |
| 31—35 | 17 |
| 36—40 | 15 |
| 41—45 | 10 |
| 46—50 | 5 |
| 51—55 | 7 |

4. The following abbreviations for characters and indices have been used throughout the text and in the tables :

| Characters | Abbreviations | Indices | Abbreviations |
|---|---|---|---|
| Stature | St | Length-Breadth Cephalic | CI |
| Sitting Height | SH | Length-Height Cephalic | LHI |
| Max. Head Length | HL | Breadth-Height Cephalic | BHI |
| Max. Head Breadth | HB | Nasal | NI |
| Auricular Height | AH | Nasal Elevation | NEI |
| Minm. Frontal Breadth | FB | Orbito-Nasal | ONI |
| Bizygomatic Breadth | BzB | Trans. Fronto-Parietal | TFPI |
| Bigonial Breadth | BB | Upper Facial | UFI |
| Inter-Orbital Breadth | IOB | Total Facial | TFI |
| Orbito-Nasal Arc | ONA | Trans. Cephalo-Facial | TCFI |
| Orbito-Nasal Breadth | ONB | Vertico-Cephalo-Facial | VCFI |
| Nasal Height | NH | Zygomatico-Frontal | ZFI |
| Nasal Breadth | NB | Zygomatico-Mandibular | ZMI |
| Nasal Depth | ND | Stature-Sitting Height | SSI |
| Upper Facial Height | UFH | | |
| Total Facial Height | TFH | | |
| Horz. Head Circumference | HC | | |
| Sagittal Arc | SA | | |
| Transverse Arc | TA | | |

With some eminent Indian authors (Guha, 1935 ; Mahalanobis *et al* 1949 ; Mazumdar, 1950 ; Karve *et al* 1951 ; Mazumdar *et al*, 1958) it is the practice to call nasal height (n — sn) wrongly (already pointed out by Chattopadhyay, 1952) as nasal length. In this paper, however, nasal height with abbreviation NH has been used all throughout. For nasal depth abbreviation ND has been preferred. Mazumdar and Rao (1958 : 224) have occasionally used NH for nasal depth because of the wrong notion that the nasal depth is the same as the nasal height (Mazumdar and Rao, 1958 : 331). I have also adhered to the western usage for upper facial height (UFH) and total facial height (TFH) instead of 'length'. For, the dimensions are vertical and as such 'height' is more appropriate.

5. Some of the statistical constants given by Karve and Dandekar (1951) are not comparable as has already been pointed out by Sarkar (1951-52). The mean values of AH available for the three series are misleading. Present study records a very low value in contrast to very high values given by Karve and Dandekar. Such wide variation most probably implies some error in taking the measurement by the investigators involved. It seems,

therefore, very unwise to use AH for comparative purpose. Standardization of method of taking the measurement is urgently needed. The writer took the measurement by direct method with the help of Martin's auricular needle while Karve and Dandekar (1951 : 45) used indirect method deducting the height of "the floor to the floor of the auditary meatus" from stature (neglecting the international practice of deducting height tragus from height vertex (stature). The most satisfactory method, however, is to use Parallelometer of Schultz. The mean values for NL (NH), UFL (UFH) and TFL (TFH) given by Karve and Dandekar are also not, strictly speaking, comparable as they have used sellion instead of internationally agreed landmark nasion. But the error is not likely to be more than a mm or so. For SA though Karve and Dandekar have used nasion, this measurement along with TA seems not to be correct for some other reason. It appears (Karve and Dandekar, 1951 : 46) that the quantity of hairs etc. has affected in obtaining the measurements. But if the hairs are being parted along the line of measurement (and this is quite easy though little time taking with the help of a comb or better a large size needle or the like) the hairs can no longer obstract in taking the measurement. It appears, partly from the high values of SA and TA, that they did not follow the procedure noted above. It is, therefore, not very safe to use SA and TA values for any comparative purpose. For the same reason the values of HC recorded by Karve and Dandekar (1951) are not possibly comparable. But the magnitude of error is surely less in case of HC compared to SA and TA.

6. Incorrectness of mean NH and NI value given by Karve and Dandekar (1951) has already been pointed out and the values are not therefore, strictly speaking, comparable. In case of Table 17 (i) and 17 (ii), however, corrected values of NH and NI would rather emphasize the underlying assumption. Because, nasion is slightly above sellion point.

7. Two series viz., Dom (1949) and Chamar (1949) belong to Uttar Pradesh and were measured by D. N. Mazumdar. The published data given by Mahalanobis *et al* (1949) have been utilized. Eight series belong to the castes of Bengal. Three series viz., Pod (1891), Bagdi (1891) and Chandal (1891) by Risley have been utilized. Muchi (1936) has been adopted from Chakladar (1936). But some figures pertaining to the Muchi (1936) have also been quoted from Raychaudhuri (1952). Three series viz., Pod (1952), Namasudra (1952) and Bagdi (1952) have been adopted from Raychaudhuri (1952). Namasudra (1958) has been adopted from Mazumdar and Rao (1958). Both Mahar series belong to Maharashtra by region. Mahar (1907) series is from Risley (1907) while Mahar (1960) is based on the material of present study.

8. It has been noted earlier that the rank score pattern (pertaining to common four types) specially of the Muchi (Chakladar) and partly of the Pod (Raychaudhuri) are different from the general pattern, the former group with respect to MDM and SDM and the latter group with respect to SDM. In certain sense the Dom (Mazumdar) with respect to SMM and the Mahar (Risley) with respect to SDM show some deviation. Complete absence of MDL among the Mahars (Risley) and MDC and MML among the Namasudra (Mazumdar) is noteworthy. No less spectacular is the complete absence of SML among the Bagdi (Raychaudhuri) and the Mahars (Risley). Very high % occurrence of TDM among the Dom (Mazumdar) and specially SML among the Muchi (Chakladar) is conspicuous. Complete absence of leptorrhine nose among the Mahars (Risely) is interesting only at a point of discomfort especially in view of the critical study in part IV (a) of this paper.

9. In case of four series (Appendix Table A) of Mazumdar (1958) adopted from Mazumdar and Rao (1958) mean values of CI and NI have been worked out from the published original data. It should, however, be noted that these values are slightly different than the values given by Mazumdar and Rao (1958 : Table 6.2.2.), as the latter values are actually estimate of median and not mean as has been pointed out by the authors in the text (Mazumdar and Rao, 1958 : 266). But the values have been shown in a misleading way under the column of mean in table 6.2.2. and 6.2.3.

10. In part IV (b) of the present paper, data of four caste groups of Risley have been included in the analysis. So far NI is concerned Risley's figures are possibly incorrect in being little high, *vide* Part IV (a). But it is apparent that as the analysis is rather based on class of indices, individuals with marginal values only will affect the conclusions arrived at.

11. Least $R_m$ value has been calculated for types MMM and MDM for the untouchable castes of India as a group. The $R_m$ value for different caste-groups of different regions of India is likely to throw further light on the race composition of Indian population. For upper castes of Bengal, MBL type appears to show least $R_m$ value while middle castes of the same region show MMM type as most important. The upper strata of Uttar Pradesh population show least $R_m$ value for MDL type. While the artisan group of that area manifestly predominates in having SMM type. The regional (horizontal) and caste variation (vertical) of types as reflected through the value of $R_m$ and % C, will give us an opportunity to quantify the variations (in respect of St, CI and NI only) present in Indian population. Detailed study in this line will be attempted later on.

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# APPENDIX

## TABLE A

### The Mahars and Other Untouchable Castes of India
### Selected character : Mean values

| Region and Caste | St | HL | HB | CI | NH | NB | NI | Sample size | Author |
|---|---|---|---|---|---|---|---|---|---|
| **South India** | | | | | | | | | |
| Paraiyan | 1621 | 186 | 137 | 73.6 | — | — | 80.0 | 40 | Thurston, 1909 |
| Madiga (Adoni) | 1631 | 186 | 139 | 75.0 | — | — | 80.0 | 30 | ,, |
| Madiga (Haspet) | 1629 | 183 | 140 | 76.5 | — | — | 77.5 | 40 | ,, |
| Holeya | 1628 | 179 | 141 | 79.1 | — | — | 75.1 | 50 | ,, |
| Mala | 1639 | 184 | 142 | 77.1 | — | — | 76.2 | 30 | ,, |
| **Bihar** | | | | | | | | | |
| Meghayadom | 1648 | 186 | 142 | 76.2 | 48 | 40 | 82.2 | 100 | Risley, 1915 |
| Dosadh | 1620 | 185 | 142 | 76.8 | 47 | 39 | 82.1 | 100 | ,, |
| Musahar | 1591 | 183 | 139 | 75.7 | 46 | 40 | 88.7 | 77 | ,, |
| Chamar | 1612 | 184 | 140 | 76.0 | 46 | 38 | 82.0 | 62 | ,, |
| **U. P.** | | | | | | | | | |
| Musahar | 1598 | 182 | 135 | 74.1 | 43 | 37 | 86.1 | 18 | ,, |
| Pasi | 1639 | 185 | 134 | 72.6 | 41 | 35 | 85.4 | 100 | ,, |
| Dom | 1665 | 186 | 138 | 73.7 | 50 | 38 | 76.0 | 113 | Mahalanobis, |
| Chamar | 1619 | 187 | 136 | 72.9 | 49 | 36 | 75.1 | 159 | Mazumdar & Rao, 1949 |
| **Gujarat** | | | | | | | | | |
| Bhangi | 1597 | 180 | 138 | 76.6 | 50 | 37 | 74.8 | 41 | Mazumdar, 1950 |
| Koli | 1608 | 181 | 140 | 77.3 | 49 | 37 | 75.2 | 121 | ,, |
| Machhi-Kharwa | 1596 | 183 | 142 | 77.8 | 49 | 37 | 75.6 | 141 | ,, |
| **Bengal** | | | | | | | | | |
| Pod | 1619 | 183 | 145 | 79.2 | 52 | 37 | 71.1 | 100 | Raychaudhuri, 1952 |
| Namasudra | 1595 | 185 | 145 | 78.4 | 52 | 37 | 70.2 | 100 | ,, |
| Bagdi | 1586 | 182 | 140 | 77.1 | 49 | 37 | 76.6 | 100 | ,, |
| Muchi | 1616 | 179 | 142 | 79.1 | 50 | 34 | 69.0 | 100 | Chakladar, 1936 |
| Bagdi | 1603 | 183 | 140 | 76.4 | 47 | 38 | 80.8 | 99 | Risley, 1915 |
| Bauri | 1603 | 185 | 139 | 75.1 | 46 | 39 | 84.3 | 20 | ,, |
| Chandal | 1619 | 183 | 143 | 78.1 | 50 | 37 | 74.2 | 67 | ,, |
| Pod | 1625 | 183 | 143 | 77.8 | 49 | 38 | 76.4 | 100 | ,, |
| Muchi | 1641 | 183 | 142 | 77.6 | 49 | 37 | 75.2 | 27 | ,, |
| Bagdi[9] | 1570 | 180 | 136 | 75.4 | 47 | 36 | 76.6 | 13 | Mazumdar & Rao, 1958 |
| Moochi[9] | 1614 | 178 | 137 | 77.1 | 48 | 35 | 74.1 | 33 | ,, |
| Namasudra[9] | 1595 | 183 | 140 | 76.8 | 49 | 36 | 72.9 | 219 | ,, |
| Namasudra[9] | 1626 | 182 | 140 | 77.1 | 50 | 35 | 70.6 | 49 | ,, |
| Pod | 1628 | 184 | 142 | 77.1 | 51 | 37 | 71.8 | 50 | Guha, 1935 |
| **Maharashtra** | | | | | | | | | |
| Mahar | 1634 | 182 | 140 | 77.0 | 47 | 39 | 81.9 | 100 | Risley, 1915 |
| Mahar[6] | 1622 | 184 | 143 | 78.0 | 46 | 36 | 79.5 | 102 | Karve & Dandekar, 1950 |
| Mahar[6] | 1584 | 183 | 140 | 76.5 | 46 | 35 | 77.0 | 25 | |
| Mahar | 1607 | 182 | 139 | 76.7 | 46 | 36 | 78.0 | 150 | Present study |

# APPENDIX

## TABLE B

### St — CI NI type: Rank Scores

| Group | Dom (1949) | Chamar (1949) | Pod[10] (1891) | Bagdi[10] (1891) | Muchi (1936) | Chandal[10] (1891) | Pod (1952) | Namasudra (1952) | Bagdi (1952) | Namasudra (1958) | Mahar[10] (1907) | Mahar (Present study) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample size | 113 | 159 | 100 | 99 | 100 | 67 | 100 | 100 | 98 | 218 | 99 | 150 |
| Type | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12 |
| | | | | | R A N K S C O R E | | | | | | | |
| MMM | 5 | 5 | 2 | 4 | 2 | 1 | 2 | 1 | 1 | 4 | 1 | 4 |
| MDM | 1 | 1 | 1 | 1 | 12 | 2 | 4 | 5 | 4 | 3 | 2 | 1 |
| SDM | 4 | 2 | 3 | 2 | 7 | 3 | 8 | 3 | 1 | 1 | 10 | 3 |
| SMM | 12 | 7 | 5 | 5 | 4 | 7 | 8 | 2 | 3 | 2 | 4 | 2 |
| MBM | — | 12 | 4 | 10 | 7 | 4 | 4 | 6 | 5 | 9 | 4 | 6 |
| MML | 12 | 11 | 8 | 12 | 2 | 5 | 1 | 9 | 6 | 6 | — | 12 |
| MDL | 3 | 3 | 8 | 6 | 12 | 13 | 11 | 11 | 9 | 5 | — | 8 |
| MDC | 7 | 6 | 8 | 6 | 15 | 7 | 14 | 14 | 11 | — | 7 | 5 |
| SBM | -- | -- | 6 | 6 | 6 | 7 | 7 | 10 | 8 | 9 | 10 | 7 |
| SML | 14 | 7 | 18 | 14 | 1 | 7 | 6 | 4 | — | 8 | — | 8 |
| SDC | 11 | 10 | -- | 2 | -- | 16 | 14 | 14 | 9 | 13 | 6 | 8 |
| SDL | — | 7 | 13 | 11 | 11 | 7 | — | 12 | 6 | 6 | — | 17 |
| SMC | 14 | — | 18 | 6 | 15 | — | 11 | — | 11 | 15 | 13 | 8 |
| MMC | 10 | 12 | 18 | — | 15 | 13 | 11 | — | — | 15 | 3 | 13 |
| SBL | — | -- | 8 | — | 5 | 7 | 10 | 6 | 11 | 11 | — | 17 |
| TDM | 2 | 1 | 8 | 14 | 15 | 13 | — | — | — | 13 | 10 | — |
| MBL | — | — | 18 | 14 | 7 | 5 | 3 | 8 | — | 12 | — | 17 |
| TMM | 10 | - | -- | — | 15 | — | 11 | 14 | 11 | 15 | 7 | 13 |
| TML | 8 | — | 13 | — | 12 | — | 13 | 12 | — | 15 | — | 13 |
| TDL | 6 | 12 | 13 | — | 15 | — | — | -- | 11 | 20 | — | 17 |
| MBC | — | — | 18 | 10 | 15 | — | — | — | 11 | 20 | 15 | 18 |
| TDC | 8 | — | 18 | 14 | -- | — | — | — | 11 | — | 13 | 17 |
| TMC | — | — | 18 | 11 | — | — | — | — | — | — | 7 | 17 |
| TBL | — | — | 13 | — | 10 | — | 14 | — | — | 20 | — | — |
| TBM | 14 | — | 13 | — | 15 | — | — | -- | — | 15 | — | — |
| SBC | -- | — | 6 | 12 | — | — | — | — | — | — | 15 | — |
| TBC | - | — | — | — | — | 16 | — | — | — | — | 15 | — |

# APPENDIX

## TABLE C

St CI — NI type : % Occurrence

| Group | Dom (1949) | Chamar (1949) | Pod (1891) | Baqdi (1891) | Muchi (1936) | Chandal (1891) | Pod (1952) | Namasudra (1952) | Baqdi (1952) | Namasudra (1958) | Mahar (1907) | Mahar (Present study) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample size | 113 | 159 | 100 | 99 | 100 | 67 | 100 | 100 | 98 | 218 | 99 | 150 |
| Type | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| MMM | 7.1 | 4.4 | 15.0 | 11.1 | 12.0 | 16.4 | 12.0 | 16.0 | 20.4 | 10.6 | 26.2 | 8.7 |
| MDM | 31.9 | 40.3 | 19.0 | 22.2 | 2.0 | 13.4 | 9.0 | 9.0 | 10.2 | 12.8 | 13.1 | 20.7 |
| SDM | 8.0 | 25.2 | 9.0 | 12.1 | 5.0 | 10.4 | 5.0 | 12.0 | 20.4 | 14.7 | 3.0 | 11.3 |
| SMM | 1.8 | 3.1 | 7.0 | 10.1 | 9.0 | 4.5 | 5.0 | 14.0 | 17.3 | 14.2 | 8.1 | 19.3 |
| MBM | — | 0.6 | 8.0 | 3.0 | 5.0 | 9.0 | 9.0 | 7.0 | 6.1 | 3.7 | 8.1 | 4.7 |
| MML | 1.8 | 1.2 | 3.0 | 2.0 | 12.0 | 6.0 | 17.0 | 5.0 | 5.1 | 6.4 | — | 2.7 |
| MDL | 11.5 | 6.9 | 3.0 | 4.0 | 2.0 | 3.0 | 3.0 | 3.0 | 2.0 | 7.8 | — | 3.3 |
| MDC | 4.4 | 3.8 | 3.0 | 4.0 | 1.0 | 4.5 | 1.0 | 1.0 | 1.0 | — | 4.0 | 6.0 |
| SBM | — | — | 5.0 | 4.0 | 6.0 | 4.5 | 7.0 | 4.0 | 4.1 | 3.7 | 3.0 | 4.0 |
| SML | 0.9 | 3.1 | 1.0 | 1.0 | 17.0 | 4.5 | 8.0 | 10.0 | — | 5.5 | — | 3.3 |
| SDC | 0.9 | 1.9 | — | 12.1 | — | 1.5 | 1.0 | 1.0 | 2.0 | 1.4 | 6.0 | 3.3 |
| SDL | — | 3.1 | 2.0 | 1.0 | 3.0 | 4.5 | — | 2.0 | 5.1 | 6.4 | — | 0.7 |
| SMC | 0.9 | — | 1.0 | 4.0 | 1.0 | — | 3.0 | — | 1.0 | 0.9 | 2.0 | 3.3 |
| MMC | 2.7 | 0.6 | 1.0 | — | 1.0 | 3.0 | 1.0 | — | — | 0.9 | 10.1 | 1.3 |
| SBL | — | — | 3.0 | — | 8.0 | 4.5 | 4.0 | 7.0 | 1.0 | 3.2 | — | 0.7 |
| TDM | 12.4 | 5.0 | 3.0 | 1.0 | 1.0 | 3.0 | — | — | — | 1.4 | 3.0 | — |
| MBL | — | — | 1.0 | 1.0 | 5.0 | 6.0 | 11.0 | 6.0 | — | 2.3 | — | 0.7 |
| TMM | 2.7 | — | — | — | 1.0 | — | 1.0 | 1.0 | 1.0 | 0.9 | 4.0 | 1.3 |
| TML | 3.5 | — | 2.0 | — | 2.0 | — | 2.0 | 2.0 | — | 0.9 | — | 1.3 |
| TDL | 5.3 | 0.6 | 2.0 | — | 1.0 | — | — | — | 1.0 | 0.5 | — | 0.7 |
| MBC | — | — | 1.0 | 3.0 | 1.0 | — | — | — | 1.0 | 0.5 | 1.0 | 1.3 |
| TDC | 3.5 | — | 1.0 | 1.0 | — | — | — | — | 1.0 | — | 2.0 | 0.7 |
| TMC | — | — | 1.0 | 1.0 | — | — | — | — | — | — | 4.0 | 0.7 |
| TBL | — | — | 2.0 | — | 4.0 | — | 1.0 | — | — | 0.5 | — | — |
| TBM | 0.9 | — | 2.0 | — | 1.0 | — | — | — | — | 0.9 | — | — |
| SBC | — | — | 5.0 | 2.0 | — | — | — | — | — | — | 1.0 | — |
| TBC | — | — | — | — | — | 1.5 | — | — | — | — | 1.0 | — |

# NOTE ON THE NUTRITIONAL INDEX AND BODY BUILD OF THE NOKTE TRIBE OF TIRAP FRONTIER DIVISION, N.E.F.A.

P. N. SEN GUPTA

Various indices, based on the body measurements of height, sitting height and weight, have been suggested time to time for determining the index of body build and index of nutritional state, as accurately as possible. Body surface area, in square meters, are now determined using a Nomogram prepared in Mayo Clinic, U.S.A., on the basis of the following formula of DuBois and DuBois (Sherman, 1958): $A = W^{0.425} \times H^{0.725} \times C$. Where A is the Body Surface Area, in square meter, W is the weight in kilogram, H is the height in centimeter and C is the constant equivalent to 71.84. *Pelidisi* or Von Pirquet Index of Nutrition or Nutritional State of the subjects are calculated from the following formula based on weight in grammes and sitting height in centimeters (Mason, 1931).

$$\text{Pelidisi} \quad \frac{\sqrt[3]{10 \times \text{weight (g)}}}{\text{sitting height (cm)}} \times 100$$

The ideal value of the index was 100 for small children and 97.98 and the values below 90 and above 110 denote respectively undernutrition and obesity. Korperfulle index of body build of Buffon, *et. al.* (Martin, 1928) is considered as most suitable index for this purpose and it is calculated from the formula:

$$100 \times \frac{\text{Weight in grammes}}{(\text{height in cm.})^3} \quad \text{Korperfulle Index}$$

This value should be 1.0 and therefore this index is conveniently used in comparing the body build of different tribes.

In connection with the determination of physical fitness or vital capacity of the Nokte tribe, measurements of height, sitting height and weight of 140 male adult subjects were taken according to the standard methods. Their age (approx.) ranged between 18 to 46 years. In this publication, the frequency distribution and statistical data of height, sitting height, weight and vital capacity have been shown (Sen Gupta, 1955).

With the help of these body measurements of the Nokte tribe, their *Pelidisi* and Korperfulle index of body build have been calculated. Frequency and percentage distribution of these two indices as well as their statistical distribution are shown in Table 1. The Korperfulle indices of

TABLE 1

**Frequency and Percentage distribution of Pelidisi and Koreperfulle Indices of 140 male adults**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 83— | 90— | 93— | 96— | 99— | 102— | 105— |
| | Range | 89.9 | 92.9 | 95.9 | 98.9 | 101.9 | 104.9 | 110 |
| Pelidisi Index | Frequency | 4 | 11 | 24 | 45 | 35 | 9 | 12 |
| | Percentage | 2.8 | 7.8 | 17.2 | 32.1 | 25 | 6.4 | 8.6 |
| | | | 1.15— | 1.21— | 1.31— | 1.41— | 1.51— | 1.61— |
| | Range | | 1.20 | 1.30 | 1.40 | 1.50 | 1.60 | 1.65 |
| Korperfulle Index | Frequency | | 10 | 33 | 48 | 33 | 13 | 3 |
| | | | 7.1 | 23.5 | 34.4 | 23.5 | 9.3 | 2.1 |

| Statistical Data | Range | Mean | Standard Div. | Coeff. of Variation (V) |
|---|---|---|---|---|
| Pelidisi Index | 83.2-109.9 | 98.3 | 4.25 | 4.52 |
| Korperfulle Index | 1.15- 1.68 | 1.37 | 0.11 | 7.70 |

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different tribes of Abor hills were determined for comparing their body build (Roy, 1953). The body surface area and Korperfulle index of Nokte tribe have been compared with those of the tribes of Abor Hills in Table 2. Roy (*loc. cit.*) has not published his measurement data of sitting height of the Abor tribes for which their *Pelidisi* could not be calculated and compared with that of Nokte tribe.

It is observed from the Tables that according to the *Pelidisi* or Von Pirquet Index, 11 per cent belonged to undernutrition group, 74 per cent had satisfactory nutritional state, 6 per cent had tendency of become fatty and 9 per cent were obese. According to the Korperfulle Index, about 7 per cent had low body build, 23 per cent above medium and 12 per cent had highly satisfactory body build. Noktes had identical build with that of Milan and Simong tribes of Abor hills who lived on high hills at a distance of about 100 miles from the Base town Pasighat. Santals were of poor body build.

TABLE 2

**Comparison of Body of different tribes**

| Tribe | | Body surface area (sq. m) | Korperfulle Index | Author of measurements |
|---|---|---|---|---|
| | Nokte | 1.51 | 1.37 | Sen Gupta |
| Abor: | Padam | 1.47 | 1.35 | ,, |
| | ,, | 1.48 | 1.28 | Roy |
| | Minyong | 1.55 | 1.33 | ,, |
| | ,, | 1.49 | 1.18 | Sen Gupta |
| | Galong | 1.42 | 1.38 | ,, |
| | Pasi | 1.61 | 1.43 | Roy |
| | Milan | 1.56 | 1.37 | ,, |
| | Simong | 1.55 | 1.37 | ,, |
| | Bomdo | 1.54 | 1.41 | ,, |
| Santal | | 1.43 | 1.20 | — |
| Lepcha | | 1.54 | 1.40 | — |

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# A STUDY ON ONGE SKELETONS FROM LITTLE ANDAMAN

## PART TWO

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*Received on 28 December, 1959*

### INTRODUCTION

In an earlier paper, which is also published in this issue of the bulletin (pp. 27 to 40), the writers described the skeletal materials of two adult Onge females. In the present paper an attempt has been made to describe the remaining seven Onge skeletons comprising three adult male and three adult female skeletons, and a skeleton of a child. Of these, one male (No. L.4) and one female (No. L.2) skull are badly broken and few measurements could be taken on them. In general, the condition of the bones are brittle and proper chemical treatment had to be done before restoration.

Only one mandible, that of a child, is available to us. In practice, mandibles are removed from the graves just after the complete decomposition of the bodies. These are worn round the neck, in memory of the deceased, after ornamentation with yellow skin of *Dendrobium* (a type of plant parasite) and painting with red ochre mixed with turtle or pig's fat*.

Techniques of measurements, observations and drawings followed in this paper, are same as described in the previous paper.

### MATERIAL

The skeletal materials available are noted below :

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| **Onge Skeleton** | L.2. Adult, female. |
| *Skull* | Skull incomplete, but preserves complete occipital bone including adjacent part of the parietals, nearly complete sphenoid bone, greater part of the maxilla ; portion of the lower part of the right orbit, palatine bones and whole of the left temporal including glenoid cavity and root of the zygoma. The right temporal bone is represented by meatus, glenoid cavity and root of the zygoma. Maxillary teeth include three molars on the right side, one right premolar, second and third left molars and root of the first left molar. Besides, there are five fragments of the skull, all small and pertaining mostly to the parietals. |
| *Vertebrae* | Cervicals are represented by first, third, fourth, fifth and seventh vertebrae. All of the lumbars are represented. Dorsal vertebrae include first to eighth and greater part of the twelfth dorsal. |
| *Scapulae* | The left bone consists of upper three-fourths of the axillary border, glenoid fossa and coracoid process. The right includes entire axillary border, inferior angle, almost whole of the spine with acromion process, glenoid fossa and coracoid process. |
| *Claviculae* | Both complete, but acromion ends are slightly damaged. |
| *Ribs* | Parts of ribs of both right and left series are represented. |
| *Humeri* | Both nearly complete, but the trochlear part of the left bone is damaged. |

* Information kindly supplied by Shri Bimal Roy.

| | |
|---|---|
| *Radii* | Both complete. |
| *Ulnae* | Right complete, left missing. |
| *Pelvis & Sacrum* | The right os coxae is represented by ilium and small part of the acetabular cavity. The left includes whole of the ilium with greater part of the acetabulum and the ischial tuberosity. The sacrum is represented by body and right lateral part. |
| *Femora* | Both complete, but the medical condyle of the right femur is somewhat defective. |
| *Tibiae* | The left is complete. The right bone lacks the proximal end above the tuberosity. |
| *Fibulae* | Left complete, the right is represented by three fragments comprising the greater part of the shaft. |
| **Onge Skeleton** | L.3. Adult, male. |
| *Skull* | Skull incomplete, the best preserved parts being portion of left and right temporal bones, the lateral part of the right orbit with greater part of the right malar, part of the maxillae with nearly complete palate. The maxillary teeth include right M 1, right M 2, right PM 1 and all the three molars on the left side. |
| *Vertebrae* | Cervicals represented by first, sixth, seventh and one broken part. The dorsal vertebrae consist of eighth to twelfth and other four typical dorsal. Lumbar Vertebrae include first, second and one fragmentary piece. |
| *Ribs* | Represented by fragmentary parts of both right and left series. |
| *Scapulae* | The left bone consists of about half of the axillary border, acromial part of the spine and small portion of the glenoid fossa. The right bone includes the coracoid process, glenoid fossa and acromial end of the spine. |
| *Claviculae* | Left complete, the right bone is represented by part of the shaft. |
| *Sternum* | Xiphoidis absent but lower two-thirds of the body and the manubrium are preserved. |
| *Humeri* | Both bones complete except for head and neck portions. |
| *Radii* | The left is complete. The right is almost complete but lacks the distal end. |
| *Ulnae* | Both right and left bones are well preserved. |
| *Hand* | Right represented by second to fifth metacarpals. Left includes fourth and fifth metacarpals. Besides, there are four proximal phalanges belonging to right and left hand. |
| *Pelvis & Sacrum* | The right os coxae is represented by greater part of the ilium with part of the acetabular cavity. The left os coxae is lacking. The sacrum is complete. |
| *Femora* | Both complete, but condyles are somewhat damaged. |
| *Tibiae* | Both bones complete, but proximal ends are somewhat defective. |
| *Fibulae* | Right bone complete except for the proximal end. The left bone represented by greater part of the shaft. |
| *Foot* | First, second, third and fifth metatarsi of both right and left foot are preserved. The talus, calcaneum and cuboid of the right foot remain. The left includes complete calcaneum, navicular and fragment of talus. Besides, there are five phalanges belonging to right and left foot. |
| **Onge Skeleton** | L.4. Adult, male. |
| *Skull* | There are two chief fragments representing greater part of the occipital bone, hinder part of the parietals, whole of the left temporal bone. The facial portion is best preserved on the left side, including whole of the |

| | |
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| | orbit, complete nasal aperture with adjacent part of the left malar, part of the left frontal bone and part of the maxillae. Maxillary teeth include right M 1 and left M 1 and M 2. |
| *Vertebrae* | Excepting second and third all the cervicals are relatively intact. Dorsal vertebrae are represented by second to fourth and sixth to eleventh vertebrae. Lumbar third and fourth are also represented. |
| *Ribs* | Several fragmentary parts of both the halves are represented. |
| *Scapulae* | The right bone is missing. The left bone includes entire axillary border with the inferior angle, glenoid fossa, coracoid process as well as part of the plate or corpus. |
| *Claviculae* | Both complete. |
| *Sternum* | Manubrium and body are preserved. |
| *Humeri* | Neither is preserved. |
| *Radii* | Both complete. |
| *Ulnae* | Left bone is complete. The right bone is nearly intact, the upper part of the oblicranon being absent. |
| *Hand* | Represented by four metacarpals. Other bones are too fragmentary for identification. |
| *Pelvis* | The left os coxae is represented by greater part of the ilium including auricular facet, acetabulum, superior pubic ramus and part of the ischium. The right os coxae is lacking. |
| *Fibulae* | Left bone is complete. The right bone consists of almost entire shaft but the extremities are missing. |
| *Foot* | Represented by left talus, left medial cuneiform, five metatarsi, three phalanges and both right and left calcaneum and cuboid bone. |
| **Onge Skeleton** | L.6. Adult, female. |
| *Skull* | Nearly complete, the chief defects being the region of the anterior and middle part of the Norma Basilaris. |
| *Vertebrae* | Cervicals second, third, fourth, sixth and seventh are relatively intact. Of the dorsal vertebrae, excepting eight and ninth, all are represented. All of the lumbar vertebrae are represented. |
| *Ribs* | Some parts of broken ribs of both the sides are represented. |
| *Scapulae* | The left bone is missing. The right includes entire axillary border, glenoid fossa, spine with acromion process, superior and inferior angle. The major part of the vertebral border and part of the plate are missing. |
| *Claviculae* | Both nearly complete, but acromial end of left bone is slightly defective. |
| *Sternum* | Manubrium is preserved. |
| *Humeri* | Both bones complete, the head of the left bone being damaged. |
| *Radii* | The left radius comprises the distal end and nearly whole of the shaft, but lacks the proximal end. There is no trace of right bone. |
| *Ulnae* | Both complete. |
| *Hand* | Represented by five metacarpals and one proximal phalanx. |
| *Femora* | Both complete. |
| *Tibiae* | Both bones complete but the distal ends are somewhat defective. |
| *Fibulae* | Right bone complete. The left bone consists of the entire shaft but the ends are missing. |
| *Foot* | Represented by five metatarsi, left talus and both right and left calcaneum. |
| *Unidentified bones* | Four fragments. |
| **Onge Skeleton** | L.7. Child. |
| *Skull* | Complete. |
| *Mandible* | Complete. Mandibular teeth include first and second milk molars of both sides. In addition, there are unerupted crowns of both lower first molars. |
| *Vertebrae* | Represented by four cervicals, bodies and transverse process |

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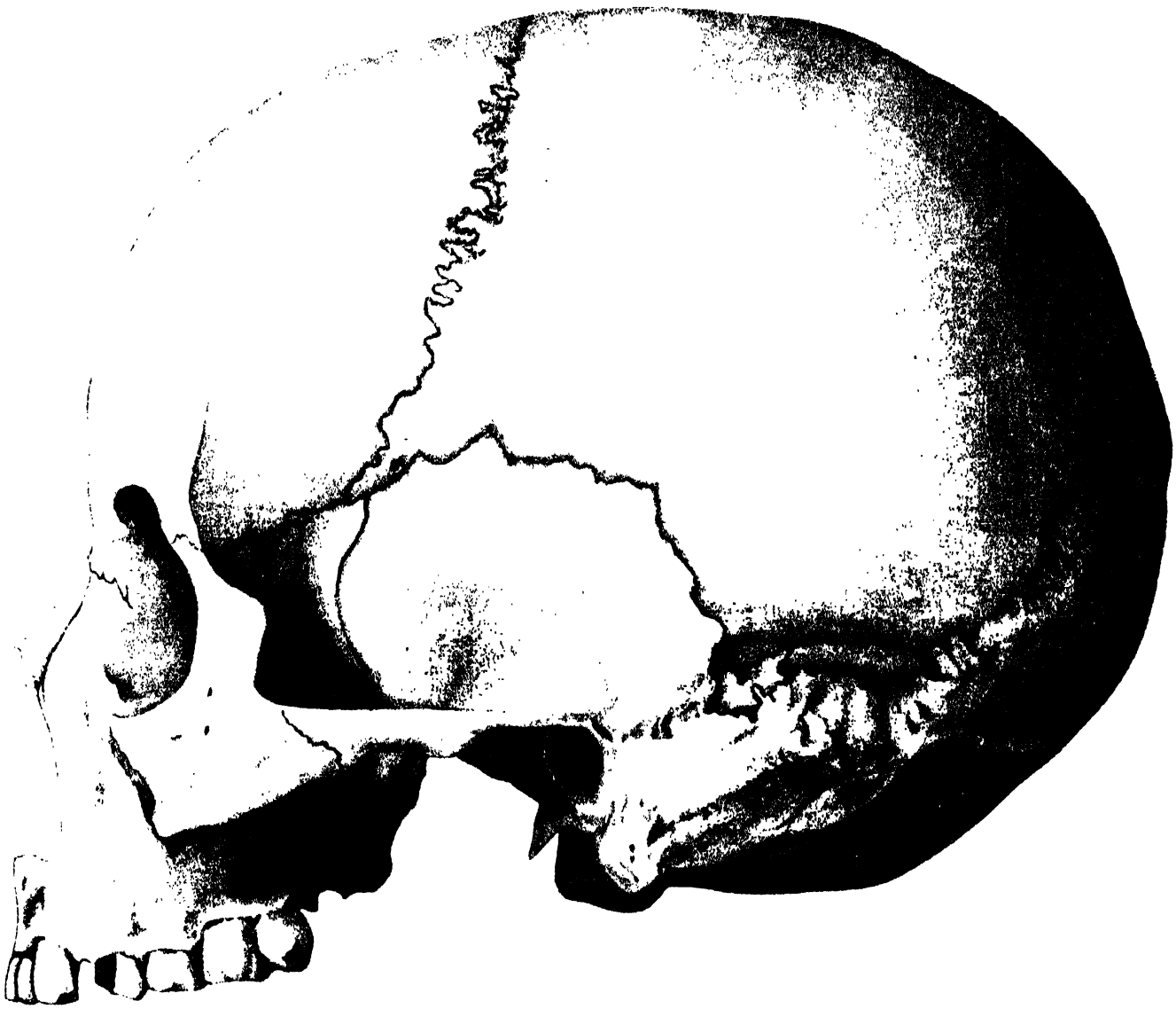
| | of twelve dorsal vertebrae and all of the lumbar vertebrae. |
| *Ribs* | Almost all the ribs of both right and left series are intact. |
| *Scapulae* | Right complete, left missing. |
| *Claviculae* | Both complete. |
| *Humeri* | Left complete, right missing. |
| *Radii* | Both bones are complete. |
| *Ulnae* | Both complete. |
| *Hand* | Represented by five metacarpals and four phalanges. |
| *Pelvis & Sacrum* | All the parts of both os coxae are represented. The sacrum is lacking. |
| *Femora* | Diaphysis of both the bones are complete. |
| *Tibiae* | Both complete. |
| *Fibulae* | Represented by complete diaphysis of both left and right bones. |
| *Foot* | Two metatarsi and five phallanges. |
| *Unidentified bones* | Four pieces. |
| **Onge Skeleton** | L.8. Adult, female. |
| *Skull* | Complete, but the nasal bones and medial border of the right orbit are broken. |
| *Vertebrae* | Three cervicals are intact. Excepting seventh and eighth, all of the dorsal vertebrae are represented. |
| *Ribs* | Parts of both right and left series are represented. |
| *Scapulae* | Right scapula is represented by upper three-fourths of the axillary border, glenoid fossa, defective spine with damaged acromial process and small part of the body. The left bone includes spine with the acromial end, glenoid fossa and coracoid process. |
| *Claviculae* | Left bone complete; the right bone is represented by sternal end with part of the shaft. |
| *Humeri* | Both complete. |
| *Radii* | Right and left bones comprise whole of the shaft with the distal ends, but proximal ends are lacking. |
| *Ulnae* | Right complete, left bone comprises nearly whole of the shaft below the coronoid process with the broken styloid process. |
| *Hand* | Represented by three metacarpals and one proximal phalanx. |
| *Femora* | Right complete; left bone nearly intact, but the trochanters are badly crushed. |
| *Patella* | Left intact. |
| *Tibiae* | Both complete. |
| *Fibulae* | Left complete; the right is nearly complete except the proximal end. |
| **Onge Skeleton** | L.9. Adult, male. |
| *Skull* | Complete. |
| *Vertebrae* | Represented by four cervical vertebrae including first and seventh cervicals and 1-6 dorsal vertebrae. |
| *Scapulae* | Both bones complete, but the acromial part of the spine in the left bone is lacking. |
| *Ribs* | The right side is represented by five nearly complete ribs and one broken part and left side by six ribs. |
| *Claviculae* | Both well preserved. |
| *Humeri* | Left complete; right missing. |
| *Radii* | Both complete. |
| *Ulnae* | Both right and left bones are intact. |
| *Pelvis* | Both os coxae are preserved. |
| *Femora* | Both right and left bones are well preserved. |
| *Tibiae* | Both complete. |
| *Fibulae* | The right bone is complete. The left bone is represented by three-fourths of the shaft below the proximal end with a defective distal end. |
| **Onge Skeleton** | L.10. Adult, male. |
| *Skull* | Complete. |
| *Vertebrae* | Represented by three typical cervicals, all the lumbar vertebrae and all the dorsal vertebrae excepting third and twelfth dorsal. |
| *Ribs* | The left series is represented by all the ribs from second to eleventh. The right series is represented by all the ribs from first to eleventh. The twelfth |

*Norma Frontalis*

DIOPTOGRAPH TRACING ( WASH DRAWING ) : ONGE MALE ( SKULL L.10 )



*Norma Lateralis*

DIOPTOGRAPH TRACING ( WASH DRAWING ) : ONGE MALE ( SKULL L.10 )

| | |
|---|---|
| | ribes of both the sides are lacking. |
| *Scapulae* | Right complete. The left bone is nearly intact, but the region of the inferior angle is slightly damaged. |
| *Claviculae* | Left complete; right missing. |
| *Humeri* | Both complete. |
| *Radii* | Both complete. |
| *Ulnae* | Right complete; left missing. |
| *Hand* | Represented by two metacarpals of the left hand and one proximal phalanx. |
| *Pelvis & Sacrum* | Complete. |
| *Femora* | Both bones complete. |
| *Tibiae* | Both complete. |
| *Fibulae* | Both complete. |
| *Foot* | Represented by talus and calcaneum of both right and left foot as well as right cuboid bone; three right metatarsi are also preserved. |

## MORPHOLOGY OF THE SKULLS

Similar to those skulls reported earlier (Part I), these skulls (pl. I - XIV) described here, also show general uniformity of external morphological traits. The sexual differences of the skulls are not very distinct. The skulls are small in size, light and thin-walled, smooth-contoured, gracile and their muscular ridges are weakly marked. Nasal bones are short and flat and the nasal roots are broad. Orbits are high. Malar bones are sub-medium in size and show slight degree of anterior projection. Zygomatic arches are slender. Tympanic bones are relatively large with sharp margins.

### SKULL L.10 (ADULT MALE)

*Norma Verticalis* (Pl. VII)

When viewed from above the skull is avoides in shape and it is comparatively long and moderately broad. The coronal and sagittal sutures are a bit complicated. Wormian bone is present on sagittal suture. Post-orbital constriction is shallow. The skull is phaenozygous. Parietal foramina are present and frontal and parietal bosses are not prominent.

*Norma Basilaris*

Muscular impressions are marked at the nuchal region. Foramen magnum is broad and oval. Occipital condyles are low and broad, while the occipital fossae are deep. The glenoid fossae are medium and short and provide evidence of side to side mastication. Dental arch is parabolic. Styloid processes are short. Basi-sphenoid is united. Mastoid processes are moderate in size and posterior nasal spines are bipartite.

*Norma Lateralis* (Pl. 1)

*Linea temporalis* is ill-marked. Wormian bone is present at the anterior region. Pterion is sphenoparietal and the region is short in space. Zygomatic arches are bowed out and upper borders slope posteriorly. Alveolar prognathism is present to a slight degree. Forehead is straight and low, and the vault of of the skull is low and flat with a regular curve at the squamo-occipital region and a sharp retreat at the nuchal region.

*Norma Frontalis* (Pl. II)

Length and breadth of the face appear to be medium. Forehead is also medium in breadth. Orbits are quadrilateral and inter-orbital space is medium. Upper orbital margins are not sharp and supercilary ridges are not prominent. Glabella, though not prominent, is slightly perceptible. Nasal root is not depressed and the nasal bridge is concave. Lower border of the nasal aperture is not sharp and the metopic suture is persisting. Nasal bones are wing-shaped, and the naso-frontal suture is curved. Margo pyriformis inferior is *amblykraspedotic* in shape and the inferior orbital foramen are well-marked by size and appearance. Nasal aperture is pyriform in shape. Canine fossae are moderate and jugam alveolum is medium in space.

*Norma Occipitalis*

Lambdoidal suture is complicated with several wormian bones. Occipital contour is wedge-shaped.

*Teeth*

Maxillary teeth are worn out probably due to rough food habits. Post molar space is short. Dental caries are present. Third molar is small in size. First and second molars are four-cuspid.

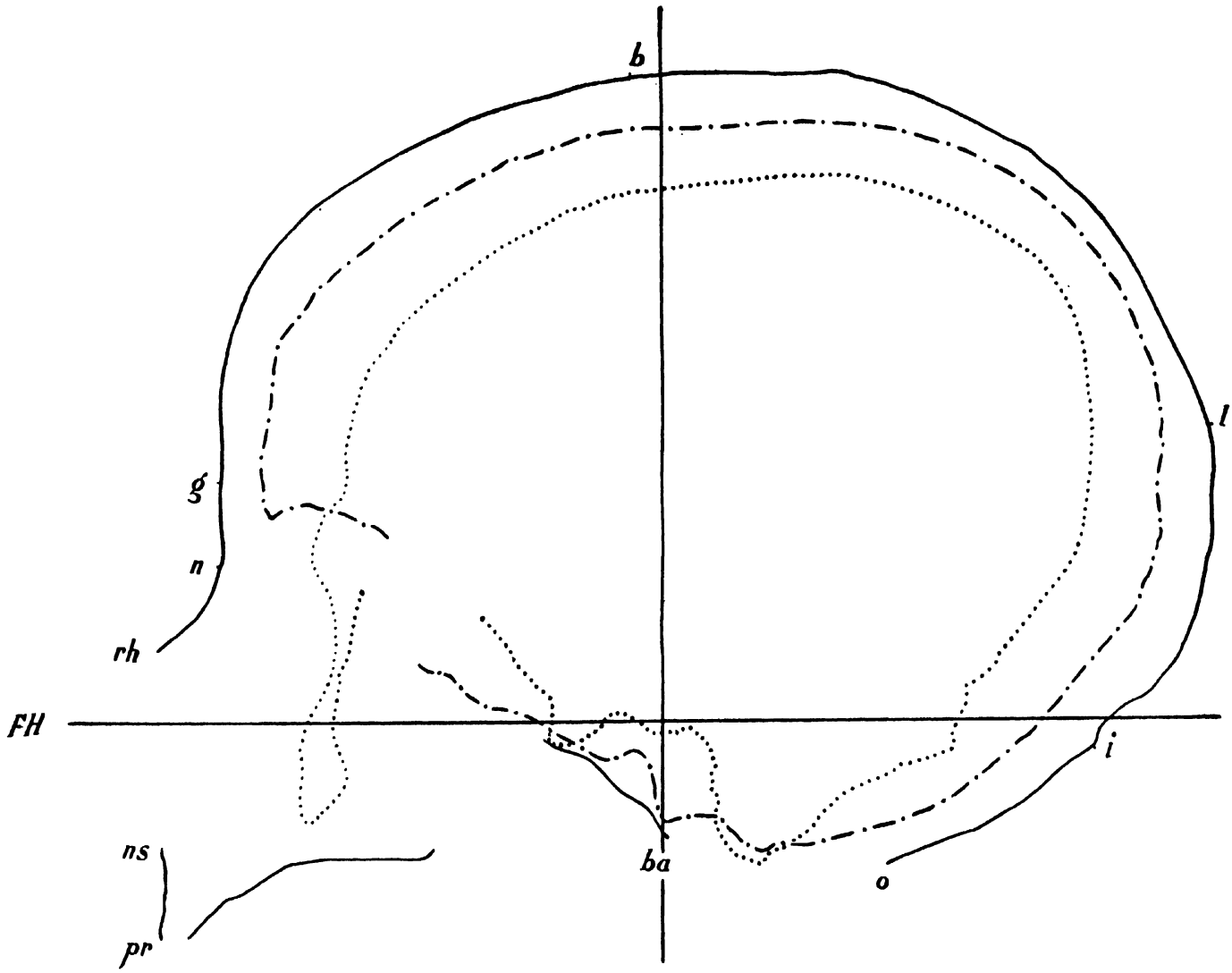



**Fig. 1**

**Sagittal curve of Onge Male Skull L.10 × natural size**

**Mid - Sagittal Section** ————————

**Mid - Orbital Sagittal Section** — . — . — . —

**Ecto-Conchion Sagittal Section** . . . . . .

SKULL L.9 (ADULT MALE)

*Norma Verticalis* (Pl. VIII, Fig. 1)

Contour of the norma verticalis is *sphenoides* in shape. Coronal and sagittal sutures are partially complicated. The skull is phaenozygous and post orbital constriction is shallow. Parietal foramen is present on the right side. Parietal bosses are moderately developed.

*Norma Basilaris*

Muscular impressions are moderately marked. Foramen magnum is broad oval in shape and the occipital condyles are low and broad. Condyloid fossae are comparatively shallow. Glenoid fossae are deep and medium in size and characterised by the evidence of side to side movement of the mandible. Dental arch is parabolic in shape. Styloid

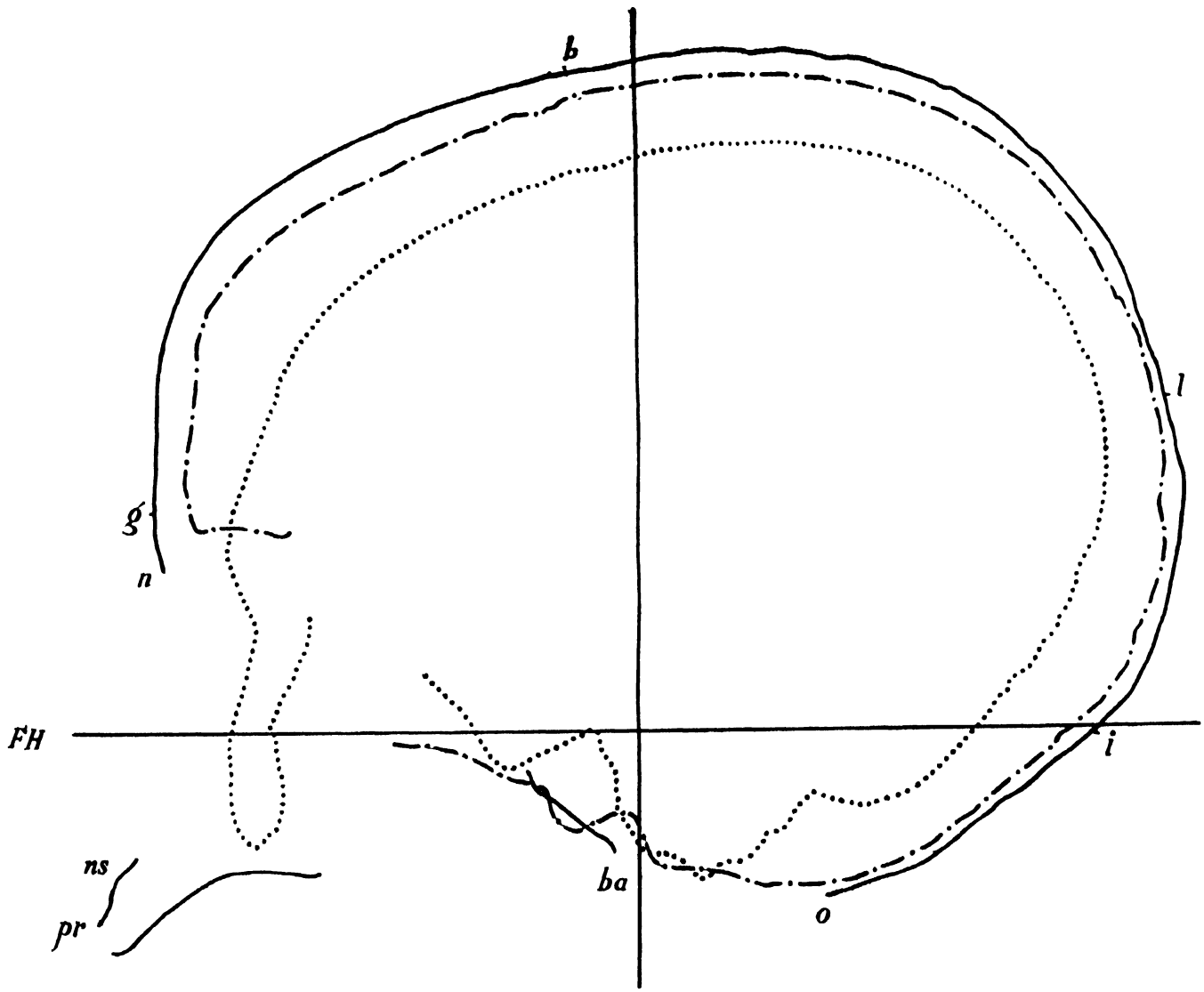



Fig. 2

Sagittal Curve of Onge Female Skull L.9 × natural size

Mid-Sagittal Section ————————
Mid-Orbital Sagittal Section — . — . — .
Ecto-Conchion Sagittal Section . . . . . .

processes are small. Basi-sphenoid is united. Mastoids are small and post nasal spine is bipartite.

*Norma Lateralis*

*Linea temporalis* is ill-marked. On both sides of the skull *os epiptericum* have formed in the *fonticulus - sphenoidalis* region. Upper border of zygomatic arch is straight. Alveolar prognathism is slightly present. Forehead is almost straight and low, the vault of the skull is low, lambdoidal flattening is present and the nuchal part shows a sharp retreat.

*Norma Frontalis*

The face appears to be flat, broad and comparatively smaller. Forehead is broad and orbits are roundish. Inter-orbital space is broad and the upper orbital margins are sharp. Superciliary ridge is not traceable and the glabella is imperceptible. Root of the nose is flat and not sunken and the

nasal bridge is straight. Lower border of the nasal aperture is not sharp. Metopic suture persists to a small extent. Nasal bones are broad and constricted and the naso-frontal suture is semi-circular. Margo pyriformis inferior is *amblykra-spedotic* in shape. Canine fossae are deep and the jugam alveolum space is medium in height. Supra-orbital incisura are present.

*Norma Occipitalis* (Pl. VIII, Fig. 2)

Wormian bones are present on the lambdoidal suture which is complicated. Contour of the Norma Occipitalis is wedge-shaped. Inion is prominent and muscular impressions are moderately marked External occipital crest is prominent.

*Teeth*

Only two first molars are present which are much worn out and four-cuspid.

SKULL L.6 (ABOUT-ADULT FEMALE)

*Norma Verticalis*

When viewed from above the contour of this norma is *sphenoides* in shape. Coronal and

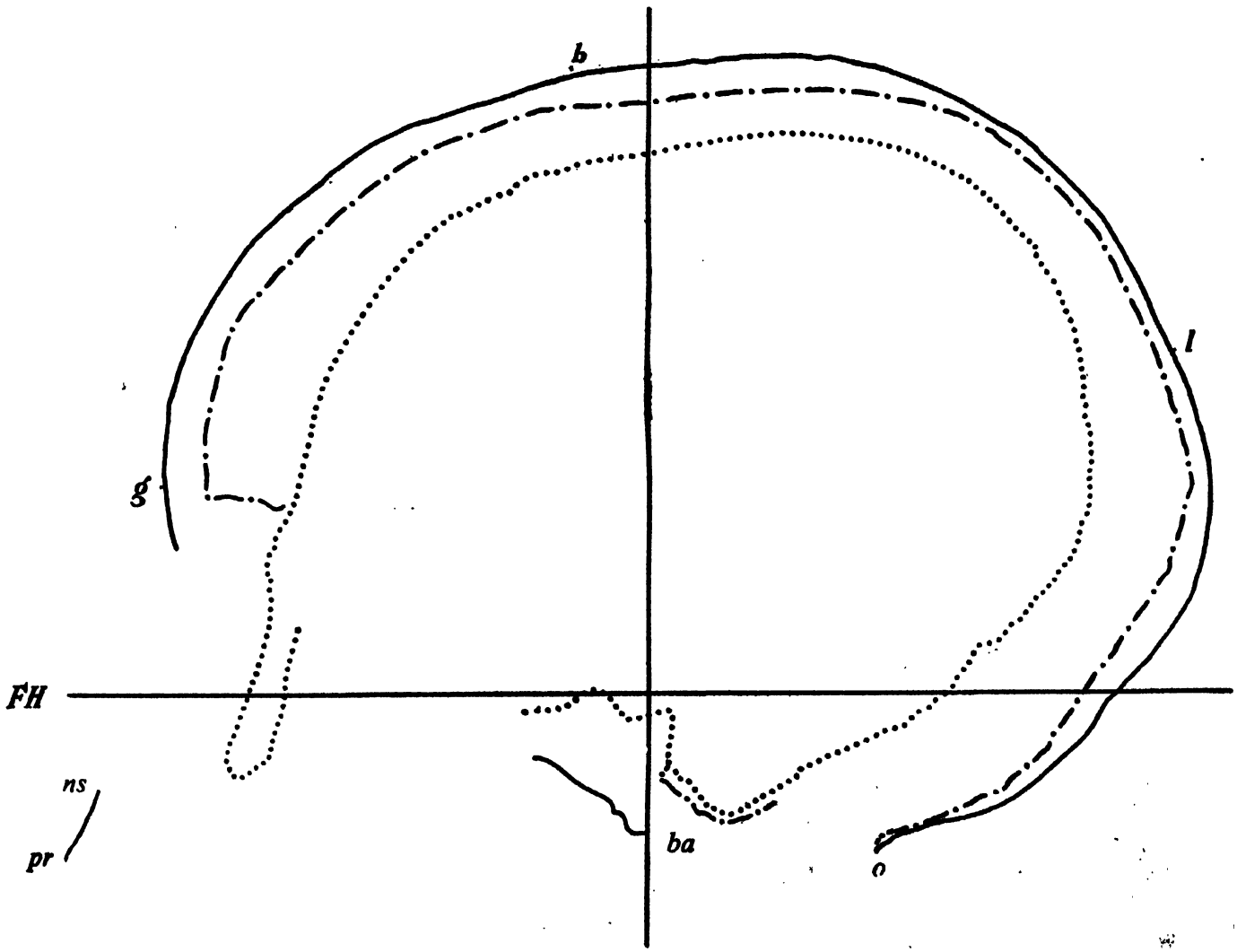


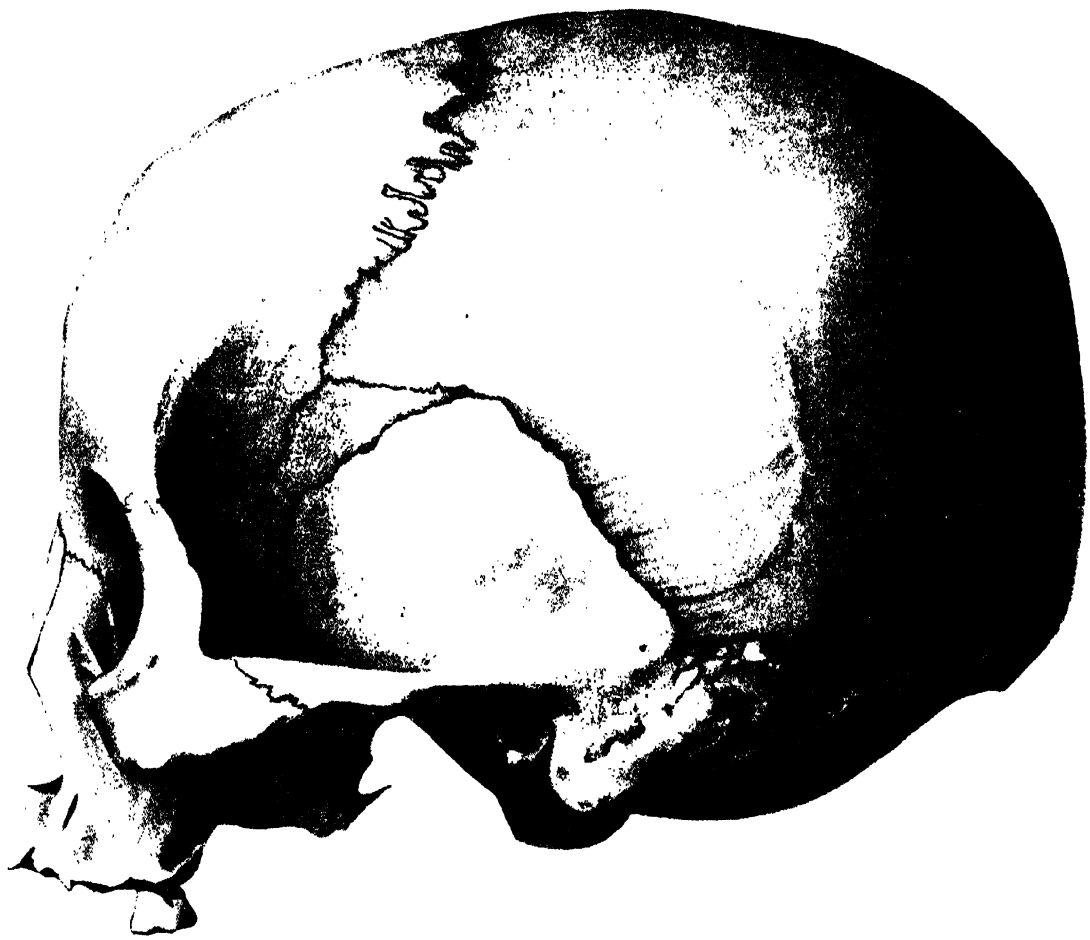

Fig. 3

Sagittal Curve of Onge Female Skull L.6 × natural size

Mid-Sagittal Section ————————

Mid-Orbital Sagittal Section — . — . — .

Ecto-Conchion Sagittal Section . . . . . .



*Norma Lateralis*

**DIOPTOGRAPH TRACING ( WASH DRAWING ) : ONGE MALE ( SKULL L.9 )**

*Norma Frontalis*

DIOPTOGRAPH TRACING ( WASH DRAWING ) : ONGE MALE ( SKULL L.9 )

sagittal sutures are partially complicated and open. Post orbital constriction is deep and the skull is phaenozygous. Parietal foramen are present on both sides, and parietal bosses are prominent.

*Norma Basilaris*

Nuchal region is smooth. Shape of the foramen magnum is *rhomboid*. Occipital condyles are narrow and high. Glenoid fossae are medium in depth and breadth and show evidence of lateral movement of lower jaw. Dental arch is *upsiloid*. Styloid processes are partially broken. Basi-sphenoid is not united and the mastoids are rudimentary. Posterior nasal spine is broken.

*Norma Lateralis*

*Linea temporalis* is imperceptible and the pterion region and the zygomatic arches are broken. The face appears to be prognathous. The forehead is low and receding, the vault of the skull is low, and the occipital bone is slightly bulging.

*Norma Frontalis* (Pl. X, Fig. 1)

Length and breadth of the face is low and broad. The forehead is medium and the orbits are roundish. Inter-orbital space is medium and the upper orbital margin is sharp; the superciliary ridge is imperceptible and the glabella is not prominent. Nasal root is not depressed. Lower border of the nasal aperture is blunt. Trace of metopic suture is present. Nasal bones are broken. Margo pyriformis inferior is *amblykraspedotic* and canine fossae are shallow. Jugam alveolum is medium in height. Supra-orbital incisura is present.

*Norma Occipitalis* (Pl. X, Fig. 2)

Lambdoidal suture is simple having a small wormian bone on it. Inion is ill-marked and the squama-occipitalis is smooth. Occipital contour is wedge-shaped.

*Teeth*

Teeth show a second degree wearing. Third molar has erupted. Molars are four-cuspid.

**SKULL L.8 (ADULT, FEMALE)**

*Norma Verticalis* (Pl. XI, Fig. 1)

When viewed from above the contour appears to be *sphenoides* in shape. Coronal and sagittal sutures are complicated. Post orbital constriction is shallow. Parietal foramen is present on both sides and parietal bosses are not prominent.

*Norma Basilaris*

Nuchal region is smooth, occipital condyles are broad and low. Glenoid fossae are deep and narrow and dental arch is *ellipsoid*. Styloid processes are partially broken. Basi-sphenoid is not united. Mastoids are rudimentary and posterior nasal spine is broken.

*Norma Lateralis*

*Linea temporalis* is imperceptible. Pterion is spheno-parietal at the right side and at the left it is broken. Zygomatic arch and its upper border is straight. Alveolar prognathism is present. Forehead is straight and medium in height; vault of the skull is low with slightly compressed lambdoid region.

*Norma Frontalis* (Pl. XII, Fig. 1)

Length and breadth of the face are medium. Forehead is narrow, orbits are quadratic in shape, inter-orbital space is medium and upper orbital margin is sharp. Superciliary ridge and glabella are not perceptible. Nasal root is not depressed and nasal bones are broken. Lower border of the nasal aperture is blunt and margo pyriformis inferior is *amblykraspedotic*. Metopic suture still persists. Canine fossae are deep and jugam alveolum space is short. Supra-orbital incisura is present.

*Norma Occipitalis* (Pl. XII, Fig. 2)

Lambdoidal sutures are complicated. Contour of the norma is wedge-shaped. Muscular impressions on the squama-occipitalis are ill-marked.

*Teeth*

Teeth are worn out. Third molar has erupted. Molars are four-cuspid.

**SKULL L.7 (CHILD)**

*Norma Verticalis* (Pl. XIII, Fig. 1)

Shape of the norma is *sphenoides*. Sutures are simple and open. Post orbital constriction is shallow. The skull is cryptozygous. Parietal foramen is present on the left side. Parietal bosses are prominent.

*Norma Basilaris*

Nuchal region is smooth and foramen magnum is oval (base posterior). Occipital condyles appear to be low and broad. Condyloid fossa is shallow and glenoid fossa is broad and shallow. Dental

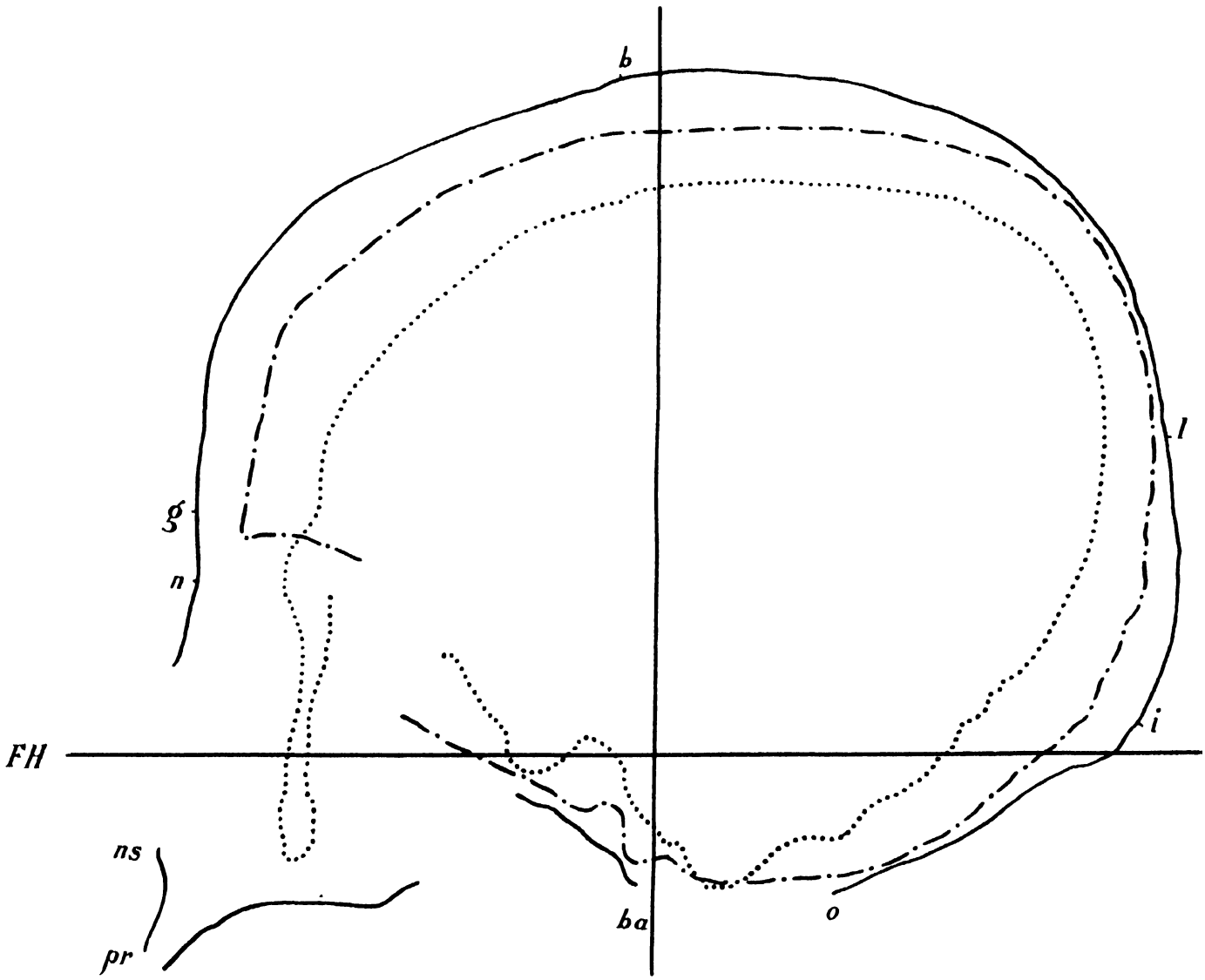



Fig. 4

Sagittal Curve of Onge Female Skull L.8 × natural size

Mid - Sagittal Section ————————

Mid - Orbital Sagittal Section — . — . — . —

Ecto-Conchion Sagittal Section . . . . . .

arch is *upsiloid* and styloid processes are rudimentary. Basi-sphenoid is not united. Mastoids are rudimentary and post nasal spine is bipartite.

*Norma Lateralis* (Pl. XIII, Fig. 2)

*Linea temporalis* is indistinct. Pterion is spheno-parietal. Zygomatic arch is straight. Slight alveolar prognathism is present. Forehead is bulging and low. Frontal arc is gradual but the parietal is flattened and the occipital is rounded. Nuchal part is gradually sloping.

*Norma Frontalis* (Pl. XIV, Fig. 1)

Length and breadth of the face is low and broad, forehead is narrow. Orbits are roundish, inter-orbital space is broad. Upper orbital margin is sharp and both superciliary ridges and glabella are imperceptible. Nasal root is not depressed and lower

border of the aperture is blunt. Metopic suture persists upto 1 mm above the nasion. Nasal bones are broken. Margo pyriformis inferior is *amblykraspodetic*. Inter-orbital formen is large and nasal aperture is triangular. Jugam alveolum space is high. Supra-orbital incisura is present.

*Norma Occipitalis* (Pl. XIV, Fig. 2)

Lambdoidal suture is simple. Contour of the norma is wedge-shaped.

*Maxillary Teeth*

Teeth are deciduous, only the first maxillary molars (permanent) are just cutting out. One canine (left) and four molars are present. First two molars are tri-cuspid and the other two are four-cuspid.

Upper first molars (right and left) are almost identical in their crown patterns but differ slightly in dimension, the left one being slightly smaller. In the upper second milk molars the labiolingual diameters are identical while the mediodistal diameter is slightly greater in the right.

*Mandibular Teeth*

Two milk molars of each side are present. First permanent molars of both sides are visible within their sockets. First molars are much smaller in size than the second. Second molars are five-cuspid and first molars are tri-cuspid.

Slight degree of wear of the milk teeth may be due to their food habits.

The skull of the child is brachycranial, orthocranial, tapienocranial, stenometop, euryen, hypsiconch and hyperchaemirrhine. The cranial capacity is 1025 cc. Osteometric measurements of the child are given in Table 25.

## WEIGHT OF THE SKULLS

The weight of the skulls were taken by the same method described in Part I (p. 30).

Weighing of four skulls were possible, which are as follows:

| | |
|---|---|
| L.7 (Child) | 184 gm |
| L.8 (Female) | 428 ,, |
| L.9 (Male) | 550 ,, |
| L.10 (Male) | 466 ,, |

It is evident that the male skull are heavier than the female, skull L.9 being heaviest of all.

## STATISTICAL OBSERVATIONS

The metric data and indices are presented in tabular form at the end of the paper (Table 1 to 25).

It appears from Table 6 that in cranial index, skulls L.8 and L.9 are brachycranial, while skull L.6 lies on the border line of mesocranial and bracycranial (falls short of brachyform by 0.31 unit only) and skull L.10 is mesocranial. Skull L.9 tends towards hyperbrachyform. In length-height and length-auricular height indices, all the skulls are hypsi-cranial or high vaulted. Similarly, in breadth-height index, all the skulls are metrio-cranial; although skull L.10 shows a tendency towards akrocranial. In transverse fronto-parietal index, skulls L.6 and L.9 are metriometop, while L.8 is stenometop and L.10 is eurymetop. The skulls are high-vaulted in relation to length or breadth as appear from length-auricular height index or breadth-auricular height index.

So far superior facial index (Table 7) is concerned both the skulls L.8 and L.10 fall on the border line of euryen and mesen class, while in other skulls requisite measurements are lacking. Nasal index (Table 7) could be calculated on three skulls, of which L.8 and L.10 are chamaerrhine, while L.9 is leptorrhine, which is remarkable to note. In orbital index three skulls L.6, L.8 and L.9 are hypsikonch and L.10 is mesokonch.

Facial prognathism is present in all the skulls, as evident from facial profile angle (Table 13). Alveolar prognathism is also apparent in all the skulls except L.10. The extent of sub-auricular region (projective distance between porion and basion) indicates mark of strength and primitiveness, the distances varying between 19 mm to 17 mm (Table 1).

## CRANIAL CAPACITY

The mustard seed method of Mollison was employed for determining the capacity of the skulls and results were obtained by taking the mean of three readings for each skull. Unfortunately, skull L.6 is not capable of being measured directly, hence calculation was made, applying Lee-Pearsons formula, $O\,C = 359.34 + 0.000365\ L \times B \times AH$. Auricular height was measured with the help of Davidson Black's Callotemeter and Mollison's Craniophore. Two female skulls, L.6 and L.8, are euencephal, and two male skulls, L.9 and L.10, are oligencephal according to Sarasin's classification. Their respective capacities are 1172 cc, 1118.83 cc,

1160 cc and 1290 cc. According to Sergi's classification all the skulls are microcephal excepting for L.6, result of which was obtained by applying formula.

## MODULUS

Cranial modulus, giving an idea of the size of the neurocranium, are as follows:

Skull L.10 = 141.67 mm
Skull L.9 = 140.33 mm
Skull L.6 = 136.00 mm
Skull L.8 = 137.67 mm
Skull L.7 = 125.83 mm

The measurements show that all the neurocrania are small in size, though the two adult male skulls, L.9 and L.10, are slightly bigger than the adult female skulls, L.8 and L.6.

## FACIAL PROJECTION IN AN ANTERO-POSTERIOR PLANE

Applying Keith's method (1929) Table 5 shows the measurements of facial projections from a vertical plane passing through the centre of the external auditory meatus at right angles to the Frankfurt Horizontal. Column |G', which gives the projection of the glabella or the length of the pre-auricular part of the skull, indicates that in skull L.8 the pre-auricular part is longest. Column 'F' shows that the projection of the nasion is least in skull L.6 and in L.8, L.9 and L.10 it is nearly equal.

So far the projection of the cheek bone is concerned, which is measured by column B, skull L.6 shows 4.5 mm, skull L.9 1 mm projection while skull L.10 shows 5 mm projection in front of the

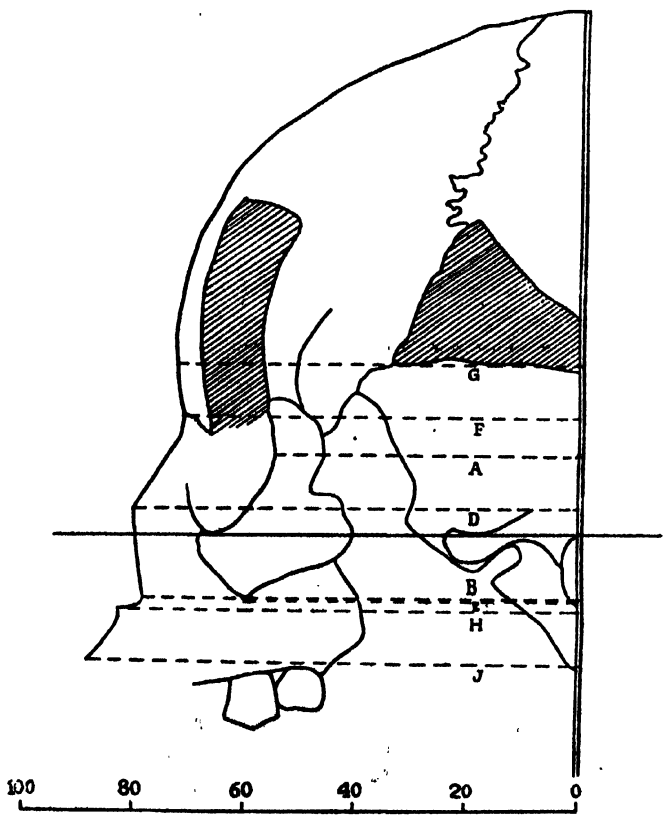



Fig. 5

Onge Female (Skull L.6)
Facial Measurements in an Antero-Posterior Plane

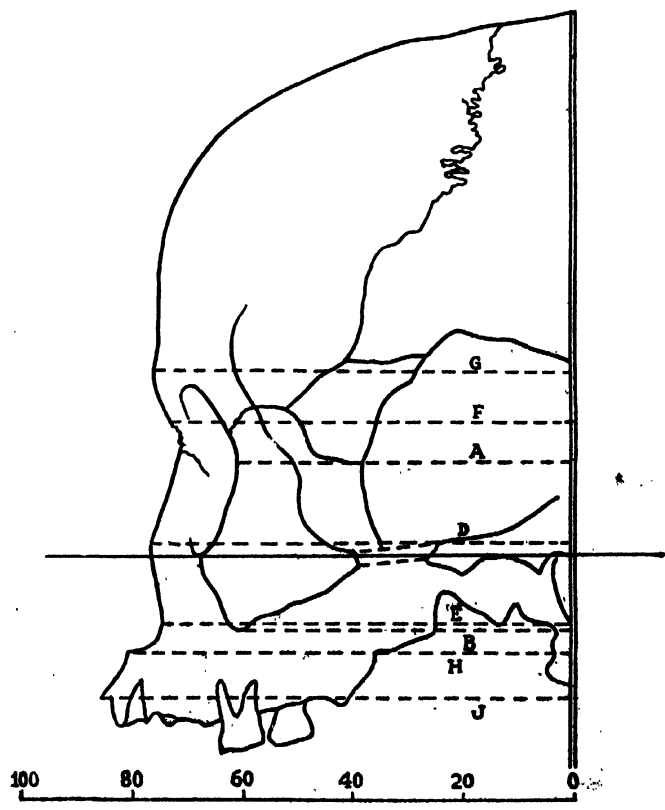



Fig. 6

Onge Female (Skull L.8)
Facial Measurements in an Antero-Posterior Plane

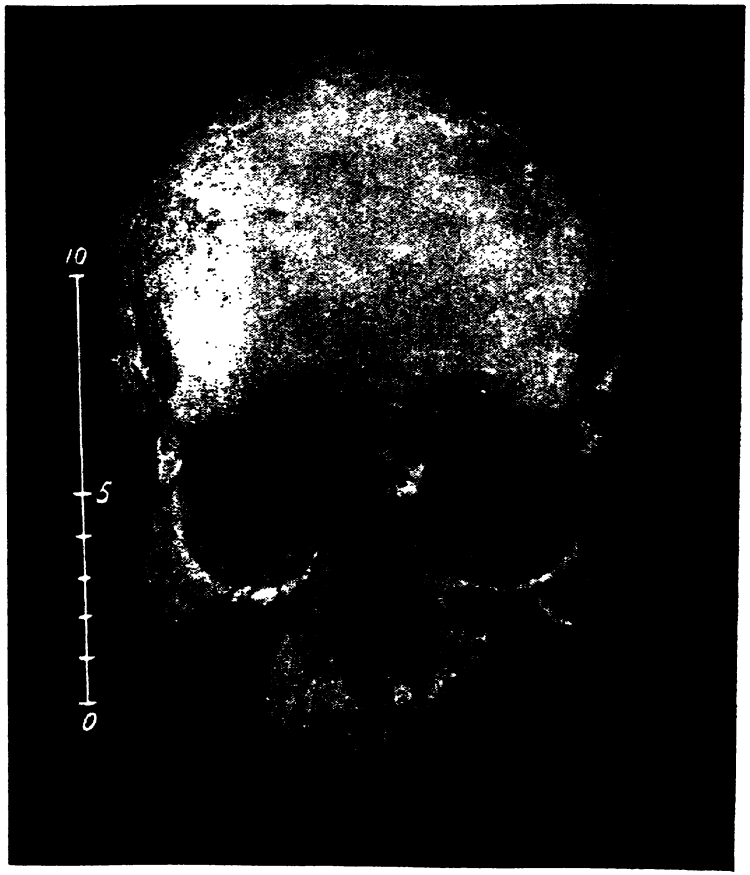



Fig. 1. *Norma Frontalis* (Skull L.8)

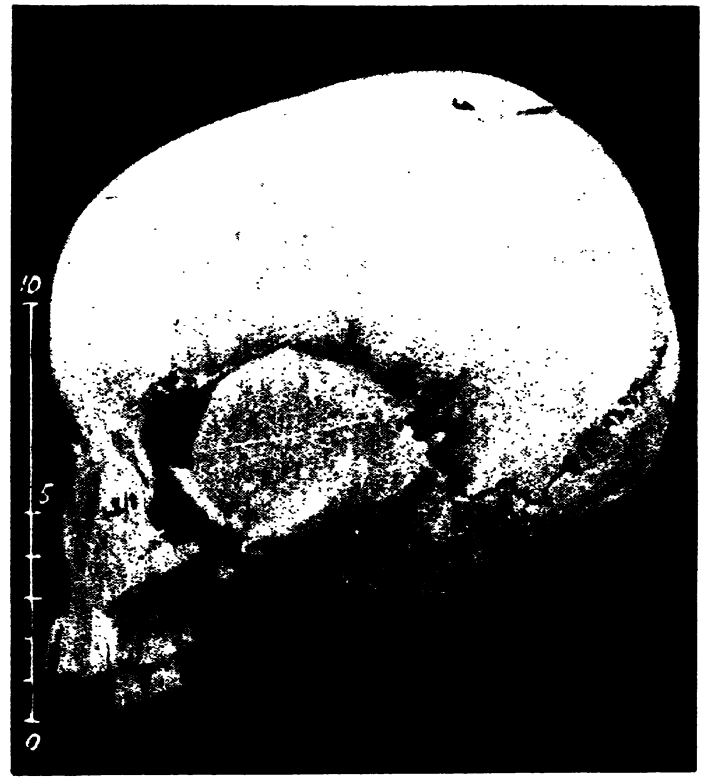



Fig. 2. *Norma Lateralis* (Skull L.8)

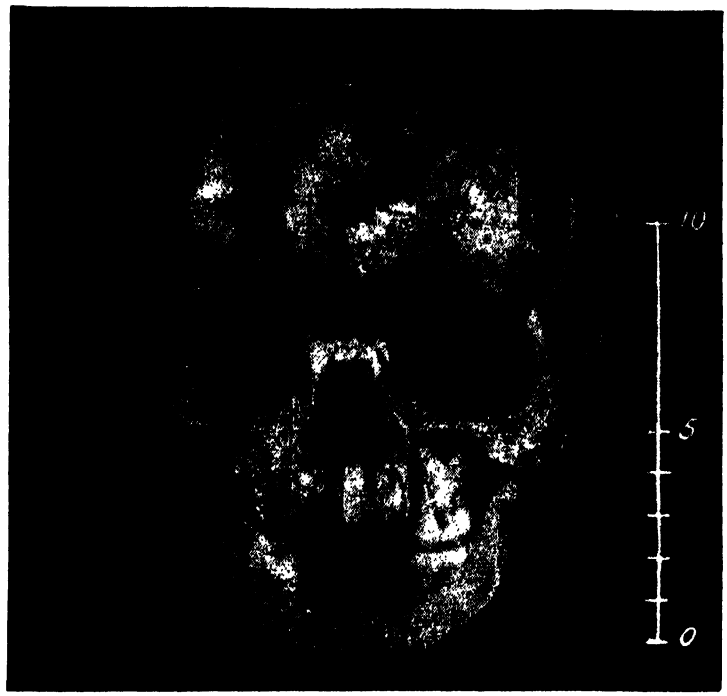



**Fig. 3.** *Norma Frontalis* Child (Skull L.7)

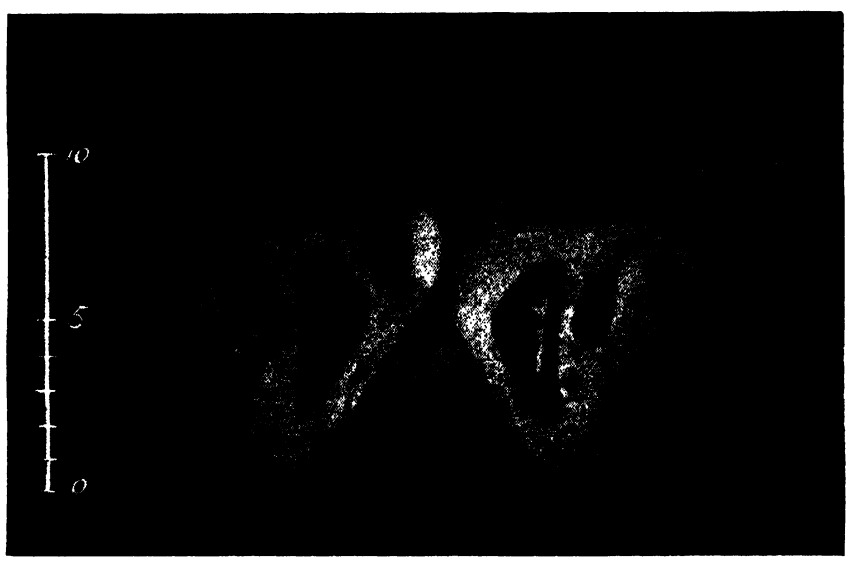



**Fig. 4.** Ventral, anterior view of pelvis (SKL L.10)

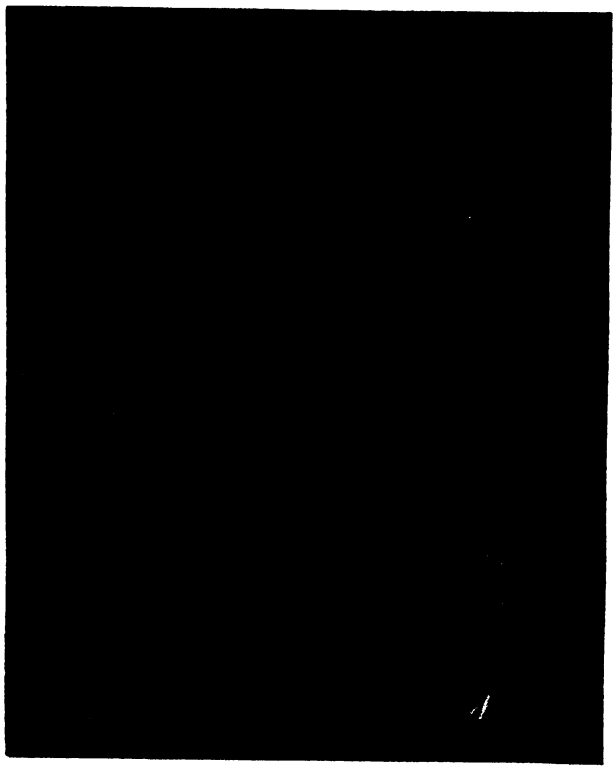


**Fig. 1.** a, Flexor aspect of left humerus of L.6.
b, Extensor aspect of right humerus of L.6.
c, Radial aspect of left ulna of L.3.
d, Volar aspect of left radius of L.3.

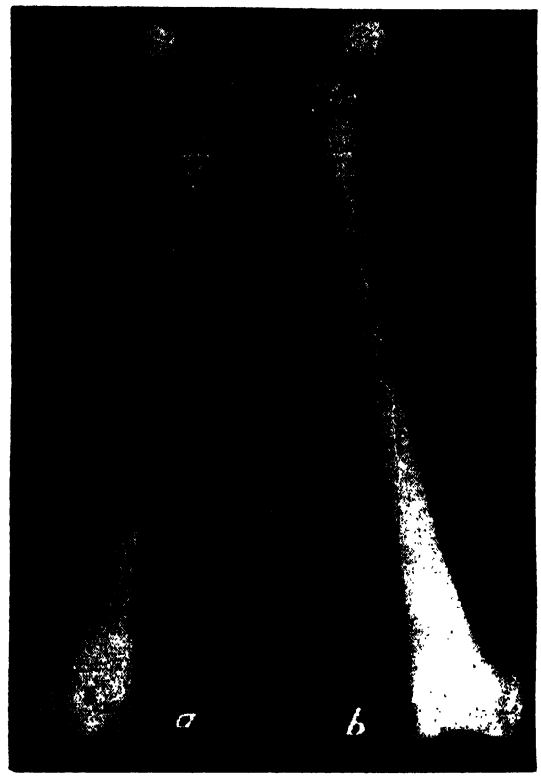



**Fig. 2.** Anterior aspect of the femora of L. 9.
a, left. b, right.

**PHOTOGRAPHS : EXTREMITY BONES**


**Fig. 3.** Anterior view of tibia and fibula in articulation.
a, right of L.9. b, left of L.9.

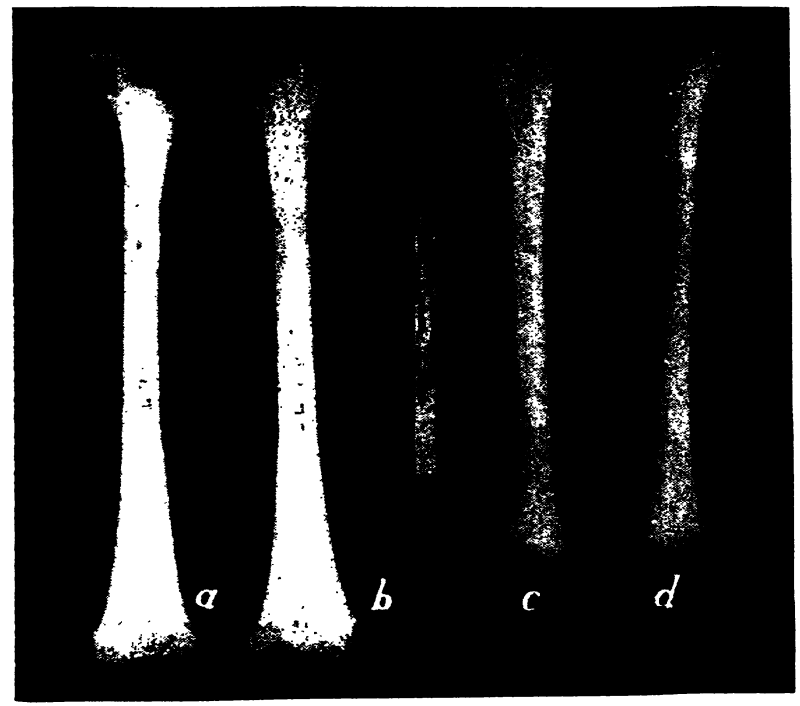



**Fig. 4.** a, b, anterior aspect of right and left femur of Onge Child (L.7).
c, d, anterior aspect of right and left tibia of Onge Child (L.7).

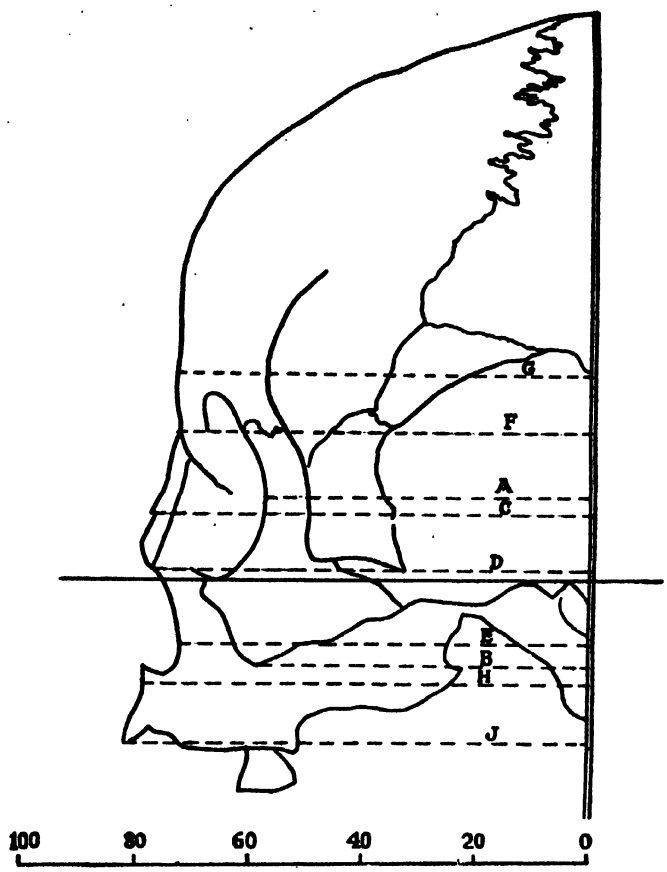



Fig. 7

Onge Male (Skull L.9)
Facial Measurements in an Antero-Posterior Plane

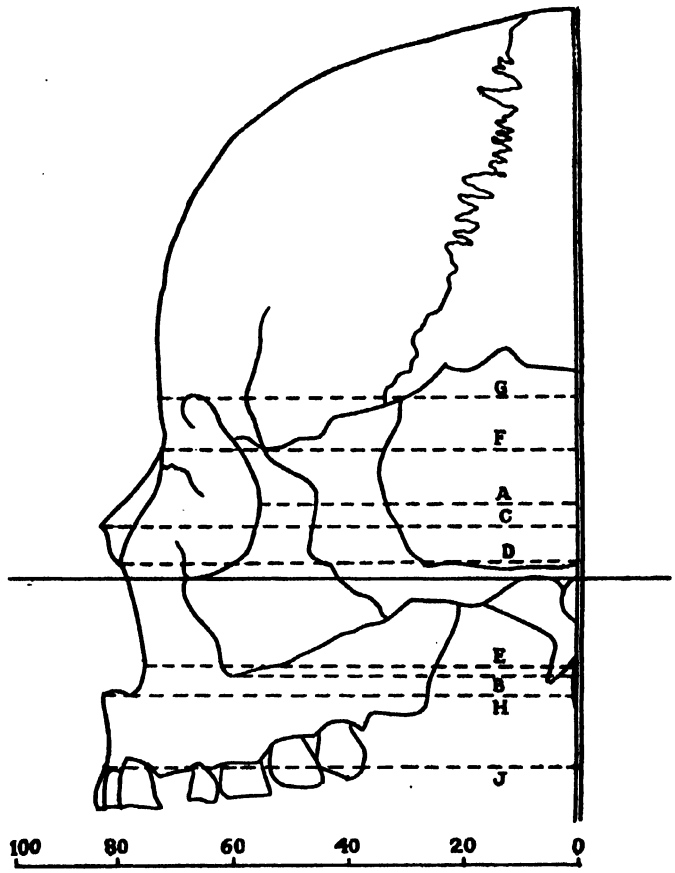



Fig. 8

Onge Male (Skull L.10)
Facial Measurements in an Antero-Posterior Plane

lateral orbital margins. Only skull L.8 does not show any such projection, both the measurements being equal.

In column 'E' are given the measurements of the projection of the least advanced part of the nose from mid-meatal point and its difference with the projection of malo-maxillary point is maximum in skull L.6 where it is 20.5 mm and in others (L.8, L.9 and L.10) it is 14 mm or so.

## STATURE AND PROPORTIONS

Stature has been calculated applying Dupertuis and Haddens' (1951) formula. Table 24 shows the calculated stature of the skeletons including skeleton L.1 and L.5 which were described in the earlier paper. It is noteworthy that among the male skeletons L.3 is short, L.10 is below medium and L.9 is very short whereas, among the female skeletons, L.6, L.8 and L.2 are short while L.1 and L.5 are below medium. Stature of the male skeleton L.9 is shortest of all the skeletons studied. None belongs to pygmy class. Stature of the living Onge are very short (after Martin's classification) according to Guha (1954), Eickstedt (1934) and Chatterjee (1955). Limb proportions are determined according to the corresponding size of relative bone of the extremity bones. Table 24 shows their indices. It appears that the upper extremity varies between 63% to 68% of the lower extremity, as judged from inter-membral index.

**EXTREMITY AND OTHER BONES**

Although in general, these bones are relatively slender and small in size, the bones of the males are larger in dimensions than the females. Skeleton L.10 is comparatively robust than the others. In L.6 epiphyseal union is nearly completed in long and other bones.

*Clavicle (table 14)*

Left clavicle of skeleton L.10 (male) is the longest in the series which is 125 mm only. Calibre index of clavicle expressing the ratio of circumference at the middle of the shaft to its maximum length indicates that the left clavicle of skeleton L.3 (male) is the stoutest of all (25.91), which is closely followed by the left clavicle of L.10 (male, 25.60). In clavicle-humeral index (Table 24) males show higher values than the females viz., L.10 and L.9 are 43.71 and 48.90 respectively and L.6 and L.8 are 39.76 and 40.55 respectively.

*Scapula (table 15)*

The maximum length and breadth of scapula which are conversely its morphological breadth and length, could be measured in skeletons L.10 and L.9; whereas in L.6 morphological breadth only measurable. In both the dimensions L.10 exceeds L.9 to a great extent. Although in both the skeletons scapular index is high indicating a primitive feature, it is comparatively higher in L.10 than that in L.9. Axillary index is lowest in L.6 (right) and highest in L.9. The values of fossorial index are low showing comparatively shorter lengths of the supra-spinous line in relation to infra-spinous line.

*Humerus (table 16)*

The maximum length is attained by skeleton L.10. Calibre index shows that males are robuster than females. Humero-radial index indicates that all are *dolichokerkik.*

*Radius (table 17)*

Radii of L.10 are the longest in the series. In calibre index L.9 attains the highest value. The sagittal diameter of the shaft of L.4 (left) is 86.96% of the transverse diameter and in L.8 (right) it is 68.18%.

*Ulna (table 18)*

Right ulna of skeleton L.10 is longest (256 mm) in the series. Right ulna of L.9 shows the highest calibre index (14.84). The curvature at the upper third of the left radius and ulna of L.3 may be due to malunited healed fracture (pl. VI fig. 1).

*Pelvis (table 19)*

In measuring the pelvis Turner's (1886) method was largely followed. Pelvis of skeleton L.10 is best preserved on which all the measurements could be taken. The obturator index of L.10 is 60.87 and that of L9. is 72.97. Pelvic brim index of L.10 is 94.62 or *mesopellic*, in others data are lacking. Ischiadic index of L.10 is 36.99 and that of L9. is 35.26.

*Femur (table 20)*

Excepting the left femur of skeleton L.6, the rest are well-preserved. It is interesting to note that all the femora are *platymeric*, the left femur of L.2 and L.8 being the only exceptions, which are 87.50 and 85.71 respectively or *eurymeric*. In pilastric index the right femur of skeleton L.8 shows highest figure which is 116.22.

*Tibia (table 21)*

All the tibiae are in good condition excepting numbers L.6 and L.2 (right), whose lengths could not be measured. Skeleton L.10 has the longest tibiae, which are 365 mm (right) and 363 mm (left) while both the bones of L.10 and L.2 are *platycnemic*, it is so in left of L.3 and right of L.9. Of the rest right tibia of L.6 is *eurycnemic* and others are *mesocnemic*. All the skeletons, on which femoro-tibial index could be worked out, are *dolichocnemic.*

*Fibula (table 22)*

Both the fibulae of L.10 are well-preserved which are longer than others. Calibre index is highest (9.43) in right fibula of L.10 and lowest (6.29) in left of L.2.

*Vertebra (table 23)*

It is apparent from the table that in all the skeletons the posterior vertical diameters of the lower dorsal vertebrae collectively exceed the anterior vertical diameters. In contrary, the anterior vertical diameters of lumbar vertebrae collectively exceed the posterior vertical diameters, except in L.3 where only first two are available. General lumbar index of L.4, L.6 and L.2 is *curtorhachic* or convex spine, of L.10 is *orthorhachic* or straight spine and of L.3 is *coelorhachic* or hollow spine.

The authors are grateful to Dr S. S. Sarkar for his instruction during the preparation of the paper.

The authors are also thankful to Shri R. C. Dey, Head Artist of this Department for the wash drawings on the dioptograph contour tracings.

**SUMMARY**

*In continuation of previous study on Onge skeleton, report on the remaining skeletons comprising three adult males, three adult females and one child has been presented in this paper. As expected in negrito skeleton, this series also shows general uniformity in many morphological traits. The skulls are brachycranial (with one exception of mesoform), high-vaulted, metriocranial and microcephal. In facial form the skulls are mostly low-faced with high orbit and broad nose with only one exception of leptorrhiny. Both alveolar and facial prognathism are evident. In general, the skulls are smooth with prominent cheek bone, rudimentary mastoid, and broad and flat nasal root. Pterion is mostly sphenoparietal. Glenoid fossa preserves evidence of lateral movement of the mandible. Teeth are much worn out probably due to grinding of rough food. In stature, calculated from extremity bones, they belong to below medium, short and very short classes. A few traits resemble mongolian feature, while in many they show primitiveness and infantile characters. Their sex diognostic features are not pronounced.*

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# TABLES

**(All linear and curvilinear measurements are in millimetre)**

## Cranial Measurements

| Skull No.: | | L.10 | L.9 | L.4 | L.6 | L.8 | L.2 | L.7 |
|---|---|---|---|---|---|---|---|---|
| Sex : | | M a l e | | | F e m a l e | | | C h i l d |
| Maximum cranial length | ... | 166.0 | 159.0 | — | 160.0 | 160.0 | — | 146.5 |
| Maximum cranial breadth | ... | 131.0 | 134.0 | — | 127.5 | 131.5 | — | 125.0 |
| Nasion inion length | ... | 148.0 | 150.0 | — | 141.5 | 146.0 | — | 136.0 |
| Basilo-bregmatic height | ... | 128.0 | 128.0 | — | 121.0 | 121.5 | — | 106.0 |
| Auricular height | ... | 108.0 | 108.5 | — | 102.0 | 105.0 | — | 93.0 |
| Least frontal breadth | ... | 92.0 | 91.5 | — | 87.0 | 86.0 | — | 80.0 |
| Greatest frontal breadth | ... | 113.0 | 108.0 | — | 108.0 (?) | — | — | 101.5 |
| Greatest occipital breadth | ... | 95.0 | 98.0 | 98.0 | 93.0 | 99.5 | 92.0 | 91.0 |
| Sagittal cranial arc | ... | 349.0 | 342.0 | — | 326.0 | 314.0 | — | 317.0 |
| Transverse cranial arc | ... | 292.0 | 290.0 | — | 272.0 | 286.0 | — | 278.0 |
| Horizontal circumference | ... | 481.0 | 471.0 | — | 454.0 | 466.0 | — | 432.0 |
| Frontal arc | ... | 122.0 | 118.0 | — | 110.0 | 116.0 | — | 105.0 |
| Parietal arc | ... | 125.0 | 120.0 | — | 112.0 | 121.0 | — | 112.0 |
| Occipital arc | ... | 102.0 | 104.0 | 107.0 | 104.0 | 107.0 | 107.0 | 100.0 |
| Frontal chord | ... | 105.5 | 104.0 | — | 98.0 | 99.0 | — | 88.5 |
| Parietal chord | ... | 112.0 | 105.0 | — | 101.0 | 101.5 | — | 98.5 |
| Occipital chord | ... | 91.0 | 90.0 | 92.0 | 90.0 | 91.5 | 93.0 | 88.5 |
| Glabella-nasion length | ... | 10.0 | 10.5 | — | 8.5 | 9.5 | — | 10.0 |
| Nasion-lambda length | ... | 165.0 | 158.0 | — | 156.0 | 157.0 | — | 144.0 |
| Bi auricular breadth | ... | 106.5 | 109.0 | — | 100.5 | 102.5 | 110.0 | 88.5 |
| Bi mastoid breadth | ... | 85.0 | 90.0 | — | 82.5 | 87.0 | 93.5 | 72.5 |

TABLE 1.

## Facial Measurements

| Skull No.: | | L.10 | L.9 | L.4 | L.6 | L.8 | L.2 | L.7 |
|---|---|---|---|---|---|---|---|---|
| Sex : | | M a l e | | | F e m a l e | | | C h i l d |
| Nasion basion line | ... | 88.0 | 85.0 | — | 84.5 | 84.0 | — | 71.0 |
| Nasion prosthion line | ... | 62.0 | 59.5 | — | — | 56.0 | — | 44.0 |
| Nasion gnathion line | ... | — | — | — | — | — | — | 73.5 |
| Prosthion basion line | ... | 87.0 | 80.0 | — | — | 82.0 | — | 68.5 |
| Bizygomatic breadth | ... | 125.0 | 119.0 | — | — | 111.0 (?) | — | 94.0 (?) |
| Nasal height | ... | 48.0 | 45.0 | 45.0 | 44.0 | 45.0 | — | 31.5 |
| Nasal breadth | ... | 24.5 | 21.0 | 23.0 | — | 23.0 | — | 19.0 |
| Inter orbital breadth | ... | 20.0 | 21.0 | — | 20.5(?) | 19.0 | — | 16.0 |
| Orbital breadth | | | | | | | | |
| Right | ... | 40.5 | 38.0 | — | 34.5 | 34.0 | — | 32.0 |
| Left | ... | 39.0 | 36.0 | 36.5 | 33.5 | 35.0 | — | 32.5 |
| Orbital height | | | | | | | | |
| Right | ... | 34.0 | 34.0 | — | 31.5 | 34.0 | — | 29.0 |
| Left | ... | 34.0 | 35.0 | 32.5 | — | 32.5 | — | 30.5 |
| Bi-orbital breadth | ... | — | — | — | 84.0 | — | — | 78.5 |
| Maxillo alveolar length | ... | 48.5 | 45.0 | — | — | 46.0 | — | 35.5 |
| Maxillo-alveolar breadth | ... | 58.0 | 54.0 | — | — | 53.0 | — | 49.0 |
| Palatal length | ... | 39.0 | 36.5 | — | — | — | — | 32.0 |
| Palatal breadth | ... | 36.5 | 31.5 | — | — | 29.5 | — | 29.0 |

| Skull No.: | L.10 | L.9 | L.4 | L.6 | L.8 | L.2 | L.7 |
|---|---|---|---|---|---|---|---|
| Sex : | M a l e | | | F e m a l e | | | C h i l d |
| Occipital foramen | | | | | | | |
| Length | 34.0 | 32.0 | — | 35.5 | 30.0 | 31.5 | 30.0 |
| Breadth | 27.0 | 26.5 | — | 29.0 | 27.0 | 30.0 | 24.5 |
| Outer bi-orbital breadth | 100.5 | 100.0 | — | 90.0 | 92.0 | — | 80.5 |
| Inner bi-orbital breadth | 90.0 | 91.0 | — | 81.0(?) | 83.0 | — | 75 5 |
| Bi-orbitonasal arc | 95.0 | 97.0 | — | 87.0 | 87.0 | — | 80.0 |
| **First molar (Upper)** | | | | | | | |
| Right Medio-distal diam. | 10.0 | 9.5 | 11.5 | — | 10.0 | — | 7.5 (de |
| Labio-lingual diam. | 11.5 | 11.0 | 11.5 | — | 11.0 | — | 8.5 |
| Left Medio-distal diam. | 10.0 | 10.0 | 11.0 | — | 10.0 | — | 7.0 |
| Labio-lingual diam. | 11.5 | 11.0 | 12.0 | — | 11.0 | — | 8.0 |
| **Second molar (Upper)** | | | | | | | |
| Right Medio-distal diam. | 9.0 | — | — | — | — | — | 9.5 |
| Labio-lingual diam. | 11.0 | — | — | — | — | — | 10 0 |
| Left Medio-distal diam. | 9.0 | — | 10.0 | — | 8.5 | — | 9.0 |
| Labio-lingual diam. | 12.5 | — | 11.5 | — | 10.0 | — | 10.0 |

TABLE 2.

### Measurements of the Nasal bone and Nasal aperture

| Skull No.: | L.10 | L.9 |
|---|---|---|
| Sex : | M a l | e |
| Nasal bone (length) | 18.0 | 16.0 |
| Nasal bone (breadth) | | |
| Top | | 8.5 |
| Waist | 6.0 | 5.5 |
| Bottom | 11.0 | 9.0 |
| Nasal aperture | | |
| Breadth | 24.5 | 21.0 |
| Height | 32.0 | 26.0 |

TABLE 3.

### Measurements of the Mandible

| Mandible No: | L.7 (Child) |
|---|---|
| Bicondylar breadth | 78.5 |
| Bigonial breadth | 63.0 |
| Length (ht) of ramus | 36.0 |
| Breadth of ramus: | |
| Minimum | 23.0 (l), 24.0 (r) |
| Maximum | 28 0 |
| Symphyseal height | 19.0 |
| Length of mandible | 41.0 |
| Mandibular angle | 130° |
| **First molar (milk)** | |
| Medio-distal diam. | 8.5 (l), 8.0 (r) |
| Labio-lingual diam. | 7.0 (l and r) |
| **Second molar (milk)** | |
| Medio-distal diam. | 11 0 (l and r) |
| Labio-lingual diam. | 9.0 (l and r) |

TABLE 4.

### Measurements of the Face in the Antero-posterior Plane

| Skull No.: | L.10 | L.9 | L.6 | L.8 |
|---|---|---|---|---|
| Sex : | M a l e | | F e m a l e | |
| A. Projection of the lateral orbital margin before mid-auricular plane | 56 0 | 58.0 | | |
| B. Projection of the malo-maxillary point ... | 61.0 | 59 0 | 59.5 | 61.0 |
| C. Projection of the nose ... | 81.0 | 78 0 | | |
| D. Projection of the ascending nasal process of maxilla ... | 81.0 | 77.5 | 80.0 | 77.0 |
| E Projection of the lateral nasal margin ... | 76.5 | 73.0 | 79.0 | 75 0 |
| F. Projection of the nasion ... | 73.5 | 73.0 | 72.0 | 73.5 |
| G. Projection of the pre-auricular ... | 74.0 | 73.5 | 73.0 | 76.5 |
| H. Projection of the subnasal point ... | 83.5 | 79.0 | 83.5 | 81.0 |
| J. Projection of the upper alveolar point ... | 83.5 | 82 0 | 89.5 | 86.0 |

TABLE 5.

### Indices of the Cranium

| Skull No.: | L.10 | L.9 | L.6 | L.8 | L.7 |
|---|---|---|---|---|---|
| Sex : | Male | | Female | | Child |
| Length-breadth index | 78.92 | 84.28 | 79.69 | 82.19 | 85.32 |
| Length height index | 77.11 | 80.50 | 75.53 | 75.94 | 72.04 |
| Length auricular height index | 65.06 | 68.24 | 63.75 | 65.62 | 63.48 |
| Breadth-height index | 97.71 | 95.52 | 94.90 | 92.40 | 85.60 |
| Breadth-auricular height index | 82.44 | 80.97 | 80.00 | 79.85 | 74.40 |
| Calvarial height index | — | — | 77.74 | — | — |
| Bregma position index | — | — | 32.85 | — | — |
| Sagittal cranial curvature index | 42.41 | 44.74 | — | 42.44 | 42.96 |
| Transverse fronto-parietal index | 70.23 | 68.28 | — | 65.40 | 64.00 |

TABLE 6.

### Indices of the Face

| Skull No.: | L.10 | L.9 | L.6 | L.8 | L.7 |
|---|---|---|---|---|---|
| Sex : | Male | | Female | | Child |
| Superior facial index | 49.60 | — | — | 50.00 | 46.81 |
| Inter-orbital index | — | — | 24.40 | — | — |
| Orbital index | | | | | |
| Right | 83.95 | 89.47 | 91.30 | 100.00 | 90.65 |
| Left | — | — | — | — | — |
| Nasal index | 51.04 | 46.67 | — | 51.11 | 60.32 |
| Palatal index | 93.59 | 86.30 | — | — | 90.63 |
| Maxillo-alveolar index | 119.59 | 120.00 | — | 115.22 | 138.03 |
| Total Facial Index | — | — | — | — | 78.19 |

TABLE 7.

### Indices showing relation between Cranium and Face

| Skull No.: | L.10 | L.9 | L.6 | L.8 | L.7 |
|---|---|---|---|---|---|
| Sex : | Male | | Female | | Child |
| Longitudinal cranio-facial index | 52.41 | 50.31 | — | 51.25 | 46.76 |
| Transverse cranio facial index | 95.41 | 88.81 | — | 86.69(?) | 75.20(?) |
| Vertical cranio-facial index | 48.11 | 46.48 | — | 46.09 | 41.51 |

TABLE 8.

### Indices showing the relation of various Sagittal Arcs

| Skull No.: | L.10 | L.9 | L.6 | L.8 | L.7 |
|---|---|---|---|---|---|
| Sex : | Male | | Female | | Child |
| Fronto parietal index | 102.46 | 101.69 | 101.82 | 104.31 | 106.67 |
| Fronto occipital index | 83.61 | 88.14 | 94.55 | 92.24 | 95.24 |
| Parieto-occipital index | 81.60 | 86.67 | 92.86 | 88.43 | 89.29 |
| Fronto-sagittal arc index | 34.96 | 34.50 | 33.64 | 33.72 | 33.12 |
| Parieto-sagittal arc index | 35.82 | 35.09 | 34.25 | 35.17 | 35.33 |
| Occipito sagittal arc index | 29.23 | 30.41 | 31.80 | 31.10 | 31.55 |

TABLE 9.

**Indices showing the amount of Curvature (bulging) of each of the three Contour bones of the Cranium**

| Skull No.: | L.10 | L.9 | L.6 | L.8 | L.7 |
|---|---|---|---|---|---|
| Sex : | Male | | Female | | Child |
| Frontal curvature index | 86.48 | 88.14 | 89.09 | 85.31 | 81.29 |
| Parietal curvature index | 89.60 | 87.50 | 90.18 | 86.36 | 87.95 |
| Occipital curvature index | 89.22 | 86.54 | 86.51 | 88.32 | 85.50 |

TABLE 10.

**Some Additional Indices**

| Skull No.: | L.10 | L.9 | L.6 | L.8 | L.7 |
|---|---|---|---|---|---|
| Sex : | Male | | Female | | Child |
| Lambda calvarial height index | 43.03 | 42.41 | 39.74 | 41.40 | 41.67 |
| Frontal perpendicular index | 25.59 | 23.08 | 21.43 | 26.26 | 25.44 |
| Parietal perpendicular index | 21.43 | 23.80 | 21.78 | 24.88 | 23.86 |
| Occipital perpendicular index | 20.32 | 26.67 | 23.89 | 22.75 | 27.11 |

TABLE 11.

**Measurements on the Median Craniogram**

| Skull No.: | L.10 | L.9 | L.6 | L.8 | L.7 |
|---|---|---|---|---|---|
| Sex : | Male | | Female | | Chi |
| Calvarial height | 101.5 | 96.0 | 99.0 | 96.0 | 90.0 |
| Lambda calvarial height | 71.0 | 67.0 | 62.0 | 65.0 | 60.0 |
| Bregma position line | 93.5 | 89.0 | 87.0 | 86.0 | 79.0 |
| Frontal perpendicular | 27.0 | 24.0 | 21.0 | 26.0 | 22.5 |
| Parietal perpendicular | 24.0 | 25.0 | 22.0 | 26.0 | 23.5 |
| Occipital perpendicular | 18.5 | 24.0 | 21.5 | 21.5 | 21.0 |
| Nasion to foot of bregma perpendicular | 50.5 | 51.0 | 43.5 | 48.0 | 38.5 |

TABLE 12.

**Angular measurements on the Mid-Sagittal Craniogram**

| Skull No.: | L.10 | L.9 | L.6 | L.8 | L.7 |
|---|---|---|---|---|---|
| Sex : | Male | | Female | | Child |
| Frontal inclination angle | 61.5° | 60.5° | 64.0° | 61.0° | 64.5° |
| Occipital inclination angle | 98.0° | 89.5° | 90.0° | 90.0° | 89.0° |
| Facial profile angle | 80.5° | 79.5° | 71.5° | 79.0° | 80.0° |
| Calvarial base angle | 12.0° | 12.0° | 13.0° | 10.0° | 14.0° |
| Frontal curvature angle | 125.0° | 128.0° | 133.0° | 123.5° | 124.5° |
| Parietal curvature angle | 133.5° | 128.0° | 133.5° | 126.0° | 129.0° |
| Occipital curvature angle | 133.5° | 125.0° | 127.0° | 129.5° | 123.0° |
| Occipital flexion angle | 138.5° | 127.0° | 131.5° | 133.0° | 123.0° |
| Superior facial length angle | 42.0° | 42.0° | 35.5° | 39.5° | 37.0° |
| Alveolar profile angle | 90.5° | 82.0° | 65.0° | 59.5° | 81.0° |
| Prosthion-nasion-basion angle | 68.0° | 65.0° | 76.0° | 69.0° | 68.0° |

TABLE 13.

### Measurements and Indices of Clavicle

| Skeleton No.: | L.3 | | L.10 | | L.9 | | L.4 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | M | | a | | l | | e | | F | e | m | a | l | e |
| | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. |
| **Measurements** | | | | | | | | | | | | | | |
| Maximum length | 123.5 | | 125.0 | - | 112.0 | 111.0 | 110.5 | 108.0 | — | 101.0 | 103.0 | — | 108.0 | 104.0 |
| Vertical diameter at the middle | 9.0 | | 10.0 | — | 7.0 | 7.0 | 8.0 | 8.0 | 6.5 | 6.0 | 6.5 | — | 6.5 | 7.0 |
| Sagittal diameter at the middle | 10.5 | — | 11.0 | — | 9.0 | 8.5 | 10.5 | 11.0 | 8.0 | 8.0 | 9.0 | — | 7.5 | 8.0 |
| Girth | 32.0 | — | 32.0 | — | 25.0 | 25.0 | 29.0 | 31.0 | 22.0 | 23.0 | 25.0 | — | 21.0 | 22.0 |
| **Index** | | | | | | | | | | | | | | |
| Caliber index | 25.91 | — | 25.60 | — | 22.32 | 22.52 | — | — | — | 22.77 | 24.27 | — | 19.44 | 21.15 |

TABLE 14.

### Measurements and Indices of Scapula

| Skeleton No.: | L.3 | | L.10 | | L.9 | | L.4 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | M | | a | | l | | e | | F | e | m | a | | |
| | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. |
| **Measurements** | | | | | | | | | | | | | | |
| Morphological length (max. br.) | — | — | 98.5 | 98.0 | 81.5 | 79.5 | | | | | | | | |
| Morphological breadth (max. length) | | — | 129.0 (?) | 130.5 | 116.0 | 117.0 | — | — | — | 106.5 | | | | |
| Spinal axis | | — | 94.0 | 92.0 | 78.5 | 77.0 | | | | | | | | |
| Length of the supra spinous line | | — | 36.0 | 41.0 | 39.0 | 40.0 | | | | | | | | |
| Length of the infra-spinous line | | — | 93.0 (?) | 98.0 | 84.0 | 84.0 | | | | | | | | |
| Antero-posterior diameter of the glenoid fossa (vert.) | | 32.5 | 33.0 | 34.0 | 29.0 | 27.0 | 32.0 | — | — | — | 29.0(?) | 28.0 | 27.0 | 28.0(?) |
| Dorso ventral diameter of glenoid fossa (trans.) | | 24.0 | 23.5 | 24.0 | 20.0 | 20.0 | | | | 19.0 | 18.5 | 19.0 | 18.0 | 17.5 |
| Length of axillary border | — | — | 115.0 (?) | 116.0 | 106.0 | 104.0 | | | | 87.0 | — | — | 94.0 | — |
| **Indices** | | | | | | | | | | | | | | |
| Scapular index | — | - | 76.36(?) | 75.10 | 70.26 | 67.95 | — | — | | | | | | |
| Supra spinous index | — | — | 27.91(?) | 31.42 | 33.62 | 34.19 | — | -- | | | | | | |
| Infra-spinous index | — | — | 72.09(?) | 75.10 | 72.41 | 71.79 | — | -- | | | | | | |
| Axillary index | — | — | 89.15(?) | 88 89 | 91.38 | 88.89 | — | — | — | 81.69 | — | | | |
| Fossorial index | — | -- | 38.71(?) | 41.84 | 46.31 | 47.62 | — | — | | | | | | |
| Glenoid index | — | 73.85 | 69.70 | 70.59 | 68.97 | 74.07 | 70.31 | — | — | — | 63.79(?) | 67.86 | 66.67 | 62.50(?) |

TABLE 15.

### Measurements and Indices of Humerus

| Skeleton No.: | L.3 | | L.10 | | L.9 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | M | | | | | | F | e | | | l | e |
| | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. |
| **Measurements** | | | | | | | | | | | | |
| Maximum length | — | — | 286.0 | 282.0 | — | 227.0 | 254.0 | 254.0 | 254.0 | 254.0 | 248.0 | 243.0 |
| Breadth of proximal epiphyses | — | — | 43.0 | 42 0 | — | 36.5 | 38.0 | 39.0 | 36.0 | 39.0 | 36.0 | 35.0 |
| Breadth of distal epiphyses | 53.0 | 53.5 | 53.0 | 52.0 | — | 43.0 | 38.5 | 38.5 | 41.0 | 38.5 | 41.0(?) | 41.5 |
| Longitudinal diameter of head | — | — | 39.0 | 39.0 | — | 32.0 | 34.0 | 33.5 | 32.0 | 33.5 | 33.0 | 33.0 |
| Transeverse diameter of head | | — | 36.0 | 36.0 | — | 31.0 | 34.0 | 33.0 | 30.0 | 33.0 | 31.5 | 31.0 |

| Skeleton No.: | L.3 | | L.10 | | L.9 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | M | | a | l | e | F | e | | m | a | l | e |
| | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. |
| Circumference of shaft at upper third | 58.0 | 57.0 | 59.0 | 57.0 | — | 48.0 | 41.0 | 40.0 | 41.0 | 40.0 | 38.0 | 38.0 |
| Least circumference of the shaft | 49.0 | 52.0 | 53.0 | 54.0 | — | 44.0 | 39.0 | 38.0 | 41.0 | 38.0 | 38.0 | 37.0 |
| Circumference of the head | — | — | 119.0 | 117.0 | — | 109.0 | 107.0 | 105.0 | 98.0 | 105.0 | 100.0 | 102.0 |
| **Indices** | | | | | | | | | | | | |
| Caliber Index | — | — | 18.53 | 19.15 | — | 19.38 | 15.35 | 14.96 | 16.14 | 14.96 | 15.32 | 14.23 |
| Index of the head | — | — | 92.31 | 92.31 | — | 96.88 | 100.00 | 98.51 | 93.75 | 98.51 | 95.19 | 94.91 |
| **Angle** | | | | | | | | | | | | |
| Torsion angle | — | — | 41° | 34° | — | 27° | — | — | 27° | 7.5° | — | 38° |

TABLE 16.

## Measurements and Indices of Radius

| Skeleton No.: | L.3 | | L.10 | | L.9 | | L.4 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | M | | a | | l | | e | | F | e | m | a | l | e |
| | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. |
| **Measurements** | | | | | | | | | | | | | | |
| Maximum length | 228.0 | — | 240.0 | 241.0 | 181.0 | 183.0 | 207.0 | 207.0 | — | - | | - | 201.0 | 203.0 |
| Physiological length | 215.0 | — | 227.0 | 229.0 | 170.0 | 173.0 | 201.0 | 201.0 | - | — | - | — | 192.0 | 194.0 |
| Least circumference of the distal half | 33.5 | 31.5 | 35.0 | 36.0 | 29.0 | 30.0 | 30.0 | 28.0 | 27.0 | — | 28.0 | 28.0 | 23.0 | 25.0 |
| Sagittal diameter of the shaft | 11.0 | 9.5 | 10.0 | 10.0 | 8.0 | 8.0 | 10.0 | 8.0 | 7.5 | — | 7.0 | 7.5 | 8.0 | 8.0 |
| Transverse diameter of the shaft | 15.0 | 13.0 | 12.5 | 13.0 | 10.5 | 11.0 | 11.5 | 11.0 | 10.5 | — | 10.0 | 11.0 | 9.0 | 9.0 |
| **Indices** | | | | | | | | | | | | | | |
| Caliber index | 15.58 | — | 15.42 | 15.72 | 17.06 | 17.34 | 14.71 | 13.73 | — | — | — | — | 11.98 | 12.95 |
| Diaphyseal index | 73.33 | 73.06 | 80.00 | 76.92 | 76.19 | 72.73 | 86.96 | 72.73 | 71.43 | — | 70.00 | 68.18 | 88.89 | 88.89 |

TABLE 17.

## Measurements and Indices of Ulna

| Skeleton No.: | L.3 | | L.10 | | L.9 | | L.4 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | M | | a | | l | | e | | F | e | m | a | l | e |
| | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. |
| **Measurements** | | | | | | | | | | | | | | |
| Maximum length | 240.0 | 244.0 | — | 256.0 | 205.0 | 203.0 | 228.0 | — | 211.0 | 211.0 | — | 211.0 | — | 218.0 |
| Physiological length | 219.0 | 224.0 | — | 233.0 | 179.0 | 182.0 | 208.0 | 206.0 | 195.0 | 196.0 | — | 193.0 | — | 200.0 |
| Least Cir. of diaphysis | 31.0 | 30.0 | — | 28.0 | 25.0 | 27.0 | 28.0 | 29.0 | 25.0 | 27.0 | 27.0 | 26.0 | — | 23.0 |
| **Index** | | | | | | | | | | | | | | |
| Caliber Index | 14.16 | 13.39 | — | 12.02 | 13.97 | 14.84 | 13.46 | 14.08 | 12.82 | 13.78 | — | 13.47 | — | 11.50 |

TABLE 18.

## Measurements and Indices of Pelvis

| | Skeleton No.: | L.10 | L.9 | L.4 | L.2 |
|---|---|---|---|---|---|
| | Sex : | M | a l | e | Female |
| | **Measurements** | | | | |
| **A** | **External Dimensions** | | | | |
| | Height of Pelvis ... | 173.0 | 156.0 | | |
| | Breadth of Pelvis (Cristal br.) ... | 222.0 | — | | |
| | Breadth between ant. sup. iliac spine ... | 184.0 | — | | |
| | Breadth between ischial tuberosities (outer) ... | 104.0 | — | | |
| | Vertical diameter of the acetabulum ... | 50.0 (left) | 43.0 (left) | 48.0 (left) | 47.0 (left) |
| | Transverse diameter of the acetabulum ... | 45.0 ( ,, ) | 39.0 ( ,, ) | 44.0 ( ,, ) | |
| | Height of the obturator foramen ... | 46.0 ( ,, ) | 37.0 ( ,, ) | | |
| | Width of the obturator foramen ... | 28.0 ( ,, ) | 27.0 ( ,, ) | | |
| | **Indices** | | | | |
| | Breadth height index ... | 106.36 | — | | |
| | Obturator index ... | 60.87 | 72.97 | | |
| **B** | **Dimensions of the Cavity of true Pelvis** | | | | |
| | Transverse diameter of the brim ... | 93.0 | — | | |
| | Conjugate diameter of the brim ... | 88.0 | — | | |
| | Oblique diameter—right ... | 101.0 | — | | |
| | left ... | 99.0 | — | | |
| | Inferior Sagittal diameter ... | 92.0 | — | | |
| | Intertuberal diameter ... | 84.0 | — | | |
| | **Indices** | | | | |
| | Pelvic brim index ... | 94.62 | — | | |
| **C** | **Dimensions of individual bones** | | | | |
| | Length of ilium ... | 111 0 (left) | 108.0 (left) | | |
| | Breadth of ilium ... | 127.0 ( ,, ) | 112.0 (right) | 107.0 (left) | 114.0 (left) |
| | Breadth of innominate bone ... | 1 15.0 ( ,, ) | 132.0 ( ,, ) | | |
| | Length of ospubis ... | 65.0 ( ,, ) | 63.0 (left) | | |
| | Length of ischium ... | 64.0 ( ,, ) | 55.0 ( ,, ) | 58.0 (left?) | 58.0 (left) |
| | **Indices** | | | | |
| | Iliac index ... | 114.41 | — | | |
| | Pubic index ... | 51.18 | — | | |
| | Ischiadic index ... | 36 99 | 35.26 | | |

TABLE 19.

## Measurements and Indices of Femur

| | Skeleton No.: | L.3 | | L.10 | | L.9 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sex : | M | | a l | | e | | F e | | m a | | l e | |
| | | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. |
| | **Measurements** | | | | | | | | | | | | |
| **A** | **Length** | | | | | | | | | | | | |
| | Absolute length | 400.0 | 403.0 | 407.0 | 410.0 | 347.0 | 346.0 | — | 377.0 | 364.0 | 366.0 | 381.0 | 377.0 |
| | Physiological length | 398.0 | 400.0 | 404.0 | 405.0 | 342.0 | 341.5 | — | 373.0 | 361.0 | 362.0 | 375.0 | 372.0 |
| | Trochanter length in natural position | 381.0 | 383.0 | 383.5 | 383.5 | 322.0 | 322.0 | — | — | — | 340.0 | 357.0 | 355.0 |
| | Length of the femur shaft | 313.0 | 322.0 | 319.0 | 319.0 | 269.0 | 274.0 | 302.0 | 305.0 | — | 291.0 | 304.0 | 305.0 |

| Skeleton No.: | L.3 | | L.10 | | L.9 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | M | | | | | e | F | e | m | a | l | e |
| | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Ft. |
| **B. Shaft** | | | | | | | | | | | | |
| Proximal dorso-ventral diameter | 19.0 | 19.0 | 20.0 | 21.0 | 18.0 | 17.0 | 17.0 | 16.5 | 18.0 | 17.0 | 17.5 | 16.0 |
| Proximal medio-lateral diameter | 24.0 | 25.0 | 26.0 | 25.0 | 21.5 | 21.0 | 20.5 | 20.0 | 21.0 | 21.0 | 20.0 | 20.0 |
| Medial dorso-ventral diameter | 22.0 | 22.0 | 24.0 | 25.0 | 22.0 | 20.0 | 18.0 | 18.0 | 21.0 | 21.5 | 19.5 | 19.5 |
| Medial medio-lateral diameter | 21.0 | 21.0 | 23.0 | 22.5 | 19.0 | 19.0 | 16.0 | 16.0 | 19.0 | 18.5 | 18.0 | 18.0 |
| Circumference of shaft | 67.0 | 67.0 | 73.0 | 76.0 | 65.0 | 63.0 | 54.0 | 54.0 | 62.0 | 63.0 | 58.0 | 58.0 |
| **C Proximal end** | | | | | | | | | | | | |
| Oblique proximal breadth | 80.0 | 82.5 | 81.0 | 79.5 | 68.0 | 68.0 | — | 69.0 | — | 65.0 | 67.0 | 68.0 |
| Length of head and neck | 52.0 | 53.0 | 53.0 | 54.0 | 45.0 | 44.0 | — | 54.0 | 47.0 | 44.0 | 44.0 | 46.0 |
| Vertical diameter of head | 38.0 | 38.0 | 36.0 | 34.5 | 33.0 | 33.0 | — | 33.0 | 33.0 | 33.0 | 33.0 | 33.0 |
| Transverse diameter of head | 38.0 | 37.0 | 39.0 | 38.5 | 33.0 | 32.5 | — | 34.0 | 33.0 | 32.0 | 34.0 | 32.0 |
| Circumference of head | 122.0 | 122.0 | 123.0 | 122.0 | 105.0 | 105.0 | — | 105.0 | 105.0 | 105.0 | 105.0 | 106.0 |
| Vertical diameter of neck | 26.0 | 25.0 | 25.5 | 27.0 | 23.5 | 22.5 | 24.0 | 23.0 | 22.5 | 22.0 | 21.0 | 23.0 |
| Transverse diameter of neck | 22.0 | 23.0 | 20.0 | 22.0 | 18.0 | 18.0 | 18.0 | 18.0 | 16.5 | 16.0 | 17.0 | 17.0 |
| Circumference of neck | 81.0 | 80.0 | 79.0 | 80.0 | 69.0 | 69.0 | 70.0 | 71.0 | 67.0 | 68.0 | 65.0 | 67.0 |
| **D Distal end** | | | | | | | | | | | | |
| Dorso-ventral diameter of the shaft just above the condyle | 24.0 | 23.0 | | 25.0 | 21.0 | 22.0 | 21.0 | 22.0 | 20.0 | 21.0 | 20.0 | 21.0 |
| Medio-lateral diameter of the shaft just above the condyle | 27.5 | 28.0 | 24.5 | 23.5 | 21.0 | 25.0 | 26.0 | 26.0 | 24.0 | 26.0 | 24.5 | 24.0 |
| Greatest medio-lateral breadth across epicondyles | — | 69.5 | 70.0 | 70.5 | 61.0 | 62.0 | 65.0 | 65.0 | 58.0 | 58.0 | 57.0 | 59.0(?) |
| Greatest dorso-ventral length of lateral condyle | 55.0 | 58.0 | 55.0 | 54.5 | 48.0 | 47.0 | 46.0 | 50.0 | 48.0 | 48.0 | 47.5 | 48.0 |
| Greatest dorso-ventral length of medial condyle | 55.5 | 59.0(?) | 55.0 | 55.0 | 47.0 | 48.5 | 46.0 | 44.5 | 46.0 | 45.0 | 49.0 | 47.0 |
| **Indices** | | | | | | | | | | | | |
| **A Caliber** | | | | | | | | | | | | |
| Length circumference index | 16.83 | 16.75 | 18.07 | 18.77 | 19.01 | 18.45 | | 13.48 | 17.17 | 17.40 | 15.47 | 15.59 |
| Length diameter index | 10.80 | 10.75 | 11.63 | 11.73 | 11.99 | 11.42 | | 10.21 | 11.08 | 11.05 | 10.00 | 10.08 |
| **B Shape** | | | | | | | | | | | | |
| Platymeric index | 79.17 | 76.00 | 76.92 | 84.00 | 82.73 | 80.85 | 82.93 | 82.50 | 85.71 | 80.95 | 87.50 | 80.00 |
| Pilastric index | 104.76 | 104.76 | 104.35 | 111.11 | 115.79 | 105.26 | 112.50 | 112.50 | 110.53 | 16.22 | 108.33 | 108.33 |
| Popliteal index | 87.27 | 82.14 | — | — | — | — | 80.77 | 84.62 | 83.33 | – | 81.63 | 87.50 |
| **C Indices of distal end** | | | | | | | | | | | | |
| Epicondylar breadth index | — | 17.37 | 17.33 | 17.11 | 17.84 | 18.16 | 17.43 | 17.43 | 16.07 | 16.02 | 15.20 | 15.86 |
| Intercondylar index | 100.91 | 101.72 | 100.00 | 100.92 | 92.92 | 103.19 | 89.00 | 89.00 | 95.83 | 93.75 | 103.16 | 97.92 |
| Condylar length index | 13.82 | 14.50 | 13.61 | 13.46 | 14.04 | 13.76 | 13.40 | 13.40 | 13.30 | 13.26 | 12.67 | 12.90 |

TABLE 20.

## Measurements and Indices of Tibia

| Skeleton No.: | L.3 | | L.10 | | L.9 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | M | | | I | | e | F | e | | a | I | e |
| | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. |
| **Measurements** | | | | | | | | | | | | |
| **Length** | | | | | | | | | | | | |
| Maximum length (spino malleolar) | 344.0 | 346.0 | 363.0 | 365.0 | 290.0 | 289.0 | | | 309.0 | 312.0 | 327.0 | — |
| Maximum length (condylo-malleolar) | 336.0 | 332.0 | 355.0 | 358.0 | 281.0 | 280.0 | | | 302.0 | 304.0 | 320.0 | — |
| Physiolorical length | 323.0 | 320.0 | 341.0 | 344.0 | 268.0 | 267.0 | 306.0 | 306.0 | 291.0 | 294.0 | 309.0 | — |
| **Shaft** | | | | | | | | | | | | |
| Dorso ventral diameter (prox.) | 33.0 | 35.0 | 35.0 | 34.0 | 29.0 | 28.0 | 27.5 | 27.0 | 28.0 | 27.0 | 30.0 | 27.0 |
| Medio lateral diameter (prox.) | 23.0 | 26.0 | 21.5 | 22.0 | 20.0 | 21.0 | 22.0 | 21.0 | 19.0 | 22.0 | 21.0 | 16.5 |
| Dorso-ventral diameter (mid.) | 25.0 | 25.0 | 29.5 | 27.0 | 24.0 | 23.0 | 21.0 | 22.0 | 20.0 | 20.5 | 21.0 | 20.5 |
| Medio-lateral diameter (mid.) | 16.0 | 16.0 | 17.0 | 16.5 | 25.0 | 15.0 | 16.0 | 16.0 | 13.0 | 14.0 | 19.0 | 19.0 |
| Dorso-ventral diameter (distal) | 19.0 | 20.0 | 23.0 | 20.0 | 19.0 | 18.5 | 19.0 | 20.0 | 18.0 | 17.5 | 16.0 | 17.0 |
| Medio-lateral diameter (distal) | 20.0 | 21.0 | 25.0 | 25.0 | 20.0 | 20.5 | 20.0 | 21.5 | 19.0 | 18.0 | 19.0 | 20.0 |
| Dorso ventral diameter (at the neutrient foramen) | 28.0 | 27.0 | 31.0 | 29.0 | 25.0 | 25.0 | 25.0 | 24.0 | 22.0 | 23.0 | 25.0 | 25.0 |
| Medio-lateral diameter (at the neutrient foramen) | 17.0 | 18.0 | 17.0 | 17.0 | 16.0 | 15.0 | 17.0 | 17.0 | 14.0 | 15.0 | 15.0 | 15.0 |
| Circumference of shaft (mid.) | 67.0 | 65.0 | 71.0 | 66.0 | 61.0 | 60.0 | 59.0 | 60.0 | 53.0 | 55.0 | 56.0 | 58.0 |
| Least circumference of shaft | 58.0 | 58.0 | 64.0 | 63.0 | 54.0 | 55.0 | 52.0 | 53.0 | 48.0 | 48.5 | 51.0 | 51.0 |
| Proximal epiphyseal breadth | - - | 71.0 | 67.0 | 63.0 | 56.5 | 56.0 | 58.0 | 59.0 | 55.0 | 51.0(?) | 55.0 | — |
| Sagittal diameter of distal epicondyles | 31.5 | 30.5 | 33.0 | 33.0 | 28.0 | 27.0 | — | — | 25.0 | 25.0 | 30.0 | 30.0 |
| **Indices** | | | | | | | | | | | | |
| Caliber index | 16.86 | 16.76 | 17.63 | 17.26 | 18.62 | 19.03 | — | | 15.53 | 15.54 | 15.60 | — |
| Cnemic index | 60.71 | 66.67 | 54.84 | 58.62 | 64.00 | 60.00 | 68.00 | 70.83 | 63.61 | 65.22 | 60.00 | 60.00 |

TABLE 21.

## Measurements and Indices of Fibula

| Skeleton No.. | L.3 | | L.10 | | L.9 | | L.4 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | M | | | | | | | e | F | e | m | a | I | e |
| | Lt. | Rt. | Lt. | Rt. | Lt. | | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. | Lt. | Rt. |
| **Measurements** | | | | | | | | | | | | | | |
| Absolute length | — | — | 349.0 | 350.0 | | | - | — | — | 289.0 | 297.0 | — | 318.0 | — |
| Circumference at the middle of shaft | 38.0 | 39.0 | 38.0 | 41.0 | 35.0 | | 3.0 | 34.0 | 31.0 | 30.0 | 31.0 | 32.0 | 29.0 | — |
| Least circumference | 28.0 | 26.0 | 30.0 | 33.0 | — | | 2.0 | — | — | 25.0 | 27.0 | 25.0 | 20.0 | — |
| **Index** | | | | | | | | | | | | | | |
| Caliber index | | | 8.60 | 9.43 | — | 9.25 | — | — | | 8.65 | 9.09 | — | 6.29 | — |

TABLE 22.

## Measurements and Indices on Vertebrae

| Skeleton No.: | | L.3 | | L.10 | | L.9 | | L.4 | | L.6 | | L.8 | | L.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex : | | M | | a | | | | | | | | | | | |
| Measurements | | Ant. Vert. diam. | Post. Vert. diam. | Ant. Vert. diam. | Post. Vert. diam. | Ant. Vert. diam. | Post. Vert diam. | Ant. Vert. diam. | Post. Vert. diam. | Ant. Vert. diam. | Post. Vert. diam. | Ant. Vert. diam. | Post. Vert. diam. | Ant. Vert. diam. | Post. Vert. diam |
| Dorsal Vertebrae: | 9th | 17.5 | 17.0 | 16.5 | 18.0 | 12.0 | 12.5 | 15.5 | 16.0 | — | — | — | — | — | — |
| | 10th | 17.0 | 17.0 | 17.5 | 18.5 | 13.5 | 15.0 | 16.0 | 17.0 | 13.5 | 13.5 | — | — | — | — |
| | 11th | 17.5 | 19.5 | 19.5 | 21.0 | 14.0 | 15.5 | 17.0 | 18.0 | 13.5 | 14.5 | 14.5 | 16.5 | — | — |
| | 12th | 19.0 | 21.0 | — | — | 17.0 | 19.0 | — | — | 16.0 | 15.5 | 17.0 | 19.0 | 17.5 | 20.0 |
| Lumbar Vertebrae: | 1st | 20.5 | 22.0 | 21.0 | 23.5 | — | — | — | — | 16.0 | 15.5 | — | — | 21.0 | 22.0 |
| | 2nd | 19.0 | 21.0 | 22.5 | 23.5 | — | — | — | — | 17.0 | 15.0 | — | — | 21.5 | 22.0 |
| | 3rd | — | — | 23.0 | 23.0 | — | — | 18.5 | 19.5 | 15.5 | 15.0 | — | — | 22.0 | 22.5 |
| | 4th | — | — | 23.5 | 20.0 | — | — | 21.0 | 19.0 | 16.0 (?) | 14.0 (?) | — | — | 22.5 | 19.5 |
| | 5th | — | — | 22.0 | 20.0 | — | — | — | — | 15.5 | 13.0 | — | — | 21.0 | 19.5 |
| **Indices** | | | | | | | | | | | | | | | |
| Special Index on Dorsal Vertebrae: | 9th | 97.14 | | 109.09 | | 104.17 | | 103.23 | | — | | — | | — | |
| | 10th | 100.00 | | 105.79 | | 111.11 | | 106.25 | | 100.00 | | — | | — | |
| | 11th | 111.43 | | 107..69 | | 110.71 | | 105.88 | | 107.41 | | 103.79 | | — | |
| | 12th | 110.53 | | — | | 111.76 | | — | | 96.87 | | 111.76 | | 114.29 | |
| Special Index on Lumbar Vertebrae: | 1st | 107.32 | | 111.90 | | — | | — | | 96.87 | | — | | 104.76 | |
| | 2nd | 110.53 | | 104.44 | | — | | — | | 88.24 | | — | | 102.33 | |
| | 3rd | — | | 100.00 | | — | | 105.41 | | 96.77 | | — | | 102.27 | |
| | 4th | — | | 93.62 | | — | | 90.48 | | 87.50 | | — | | 86.67 | |
| | 5th | — | | 90.91 | | — | | — | | 83.87 | | — | | 92.86 | |
| General Index of the Dorsal Vertebrae | | 104.93 | | 107.48 | | 109.73 | | 105.15 | | 112.70 | | 112.70 | | — | |
| General Index of the Lumbar Vertebrae | | 108.86 | | 100.00 | | — | | 97.47 | | 90.62 | | — | | 97.69 | |

TABLE 23.

## Stature and Proportions of Onge Skeletons

| Skeleton No.: | L.3 | L.10 | L.9 | L.6 | L.1 | L.5 | L.8 | L.2 |
|---|---|---|---|---|---|---|---|---|
| Sex : | M | l | e | F | e | m | a | l | e |
| Stature after Dupertuis and Hadden | 1599.05 | 1622.18 | 1455.39 | 1467.99 | 1502.87 | 1518.53 | 1471.12 | 1487.30 |
| Clavicle-humeral index | — | 43.71 | 48.90 | 39.76 | 42.05 | 42.49 | 40.55 | 43.17 |
| Humero-radial index | — | 84.69 | 80.62 | — | — | 83.20 | — | 82.29 |
| Femoro-tibial index | 85.50 | 89.46 | 83.54 | — | 85.15 | — | 85.07 | 85.83 |
| Femoro-humeral index | — | 69.52 | 65.60 | 67.37 | 70.03 | 66.53 | 69.59 | 64.77 |
| Tibio-radial index | 66.28 | 66.07 | 62.86 | — | — | 63.39 | — | 61.47 |
| Intermembral index | — | 67.89 | 64.36 | — | — | 65.05 | — | 63.42 |

TABLE 24.

## Osteometric Measurements of Onge Child (L.7)

| Clavicle | | Lt. | Rt. |
|---|---|---|---|
| Total length | ... | 65.0 | 64.5 |
| Vertical diameter at the middle | ... | 3.5 | 3.0 |
| Sagittal diameter at the middle | ... | 6.5 | 6.0 |
| Circumference at the middle | ... | 18.0 | 18.0 |
| **Scapula** | | | |
| Morphological length (max. br.) | ... | | 42.0 |
| Morphological breadth (max. lth.) | ... | | 56.5 |
| Spinal axis | ... | | 41.5 |
| Length of the supra-spinous line | ... | | 20.0 |
| Length of the infra-spinous line | ... | | 45.5 |
| Antero-posterior diameter of glenoid fossa (Vert.) | ... | | 20.0 |
| Dorso-ventral diameter of glenoid fossa (trans.) | ... | | 10.0 |
| Length of the axillary border | ... | | 43.5 |
| Scapular index | ... | | 74.3 |
| Supra-spinous index | ... | | 35.4 |
| Infra-spinous index | ... | | 80.5 |
| Axillary index | ... | | 77.0 |
| Fossorial index | ... | | 44.0 |
| Glenoid index | ... | | 50.0 |
| **Humerus** | | | |
| Total length | ... | 118.5 | |
| Dorso-ventral diameter at the middle | ... | 9.5 | |
| Medio-lateral diameter at the middle | ... | 8.5 | |
| Least circumference | ... | 27.0 | |
| Index of robustness | ... | 22.78 | |

| Femur | | Lt. | Rt. |
|---|---|---|---|
| Total length | ... | 173.0 | 172.5 |
| Proximal dorso-ventral diameter | ... | 10.0 | 11.0 |
| Proximal medio-lateral diameter | ... | 11.5 | 12.0 |
| Medial dorso-ventral diameter | ... | 9.5 | 9.5 |
| Medial medio-lateral diameter | ... | 11.0 | 11.0 |
| Circumference at the middle | ... | 34.0 | 33.0 |
| **Tibia** | | | |
| Total length | ... | 140.5 | 143.0 |
| Dorso-ventral diameter (prox.) | ... | 13.0 | 12.5 |
| Medio-lateral diameter (prox.) | ... | 12.0 | 11.5 |
| Dorso-ventral diameter (med.) | ... | 10.5 | 10.5 |
| Medio-lateral diameter (med.) | ... | 9.5 | 9.5 |
| Dorso-ventral diameter (dist.) | ... | 10.5 | 11.0 |
| Medio-lateral diameter (dist.) | ... | 12.0 | 12.0 |
| Least circumference | ... | 32.0 | 32.0 |
| Index of robustness | ... | 22.78 | 22.38 |
| **Fibula** | | | |
| Total length | ... | 136.0 | 136.0 |
| Circumference | ... | 17.0 | 17.0 |
| **Radius** | | | |
| Total length | ... | 97.5 | 98.0 |
| Sagittal diameter of the shaft at middle | | 5.5 | 5.0 |
| Transverse diameter of the shaft at middle | ... | 6.0 | 6.0 |
| Least circumference | ... | 20.0 | 19.5 |
| **Ulna** | | | |
| Total length | ... | 107.0 | 107.5 |
| Least circumference of shaft | ... | 18.0 | 17.5 |

TABLE 25.

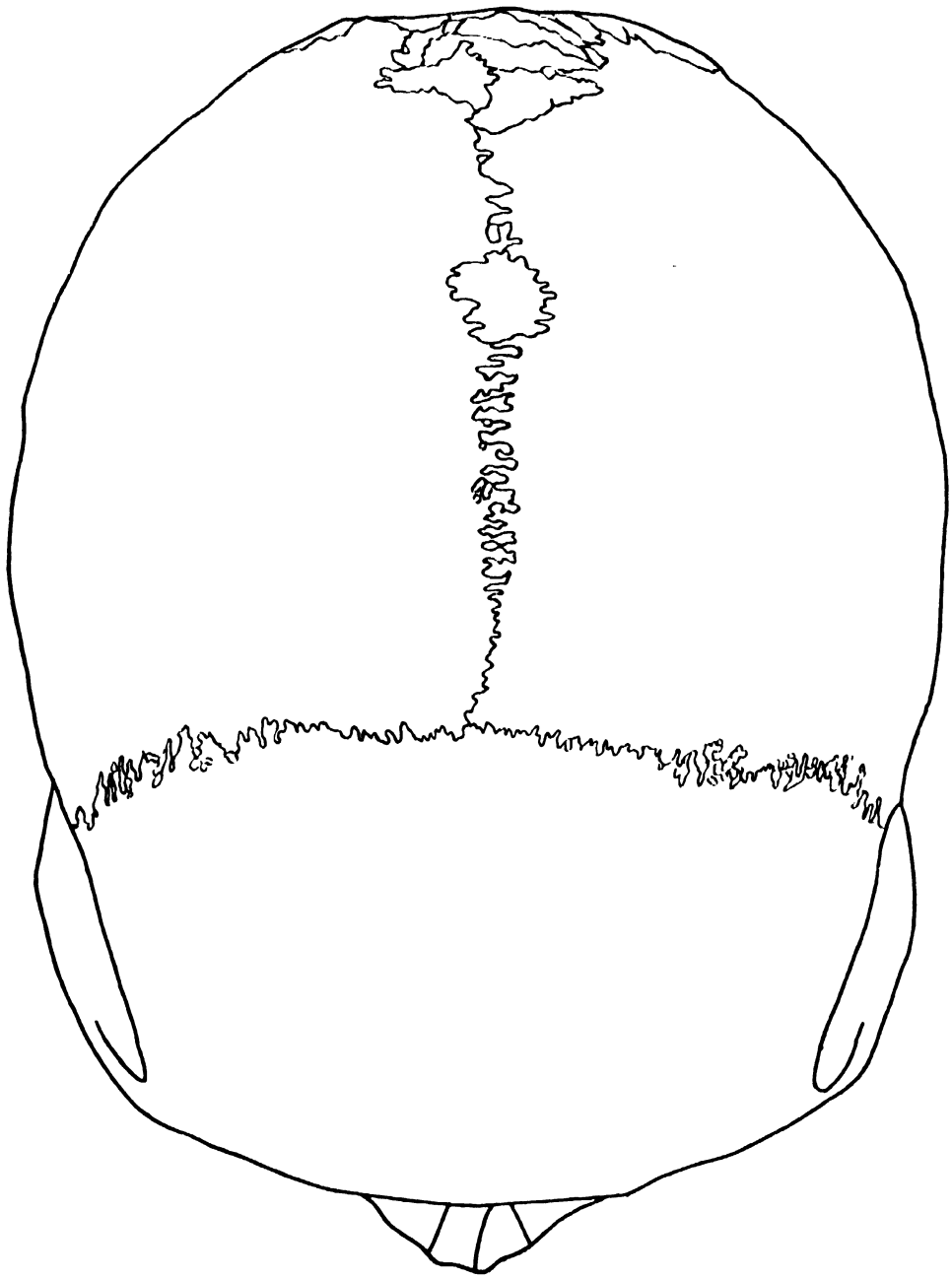

**Fig 1.** *Norma Verticalis*

DIOPTOGRAPH DRAWING : ONGE MALE (L.10)

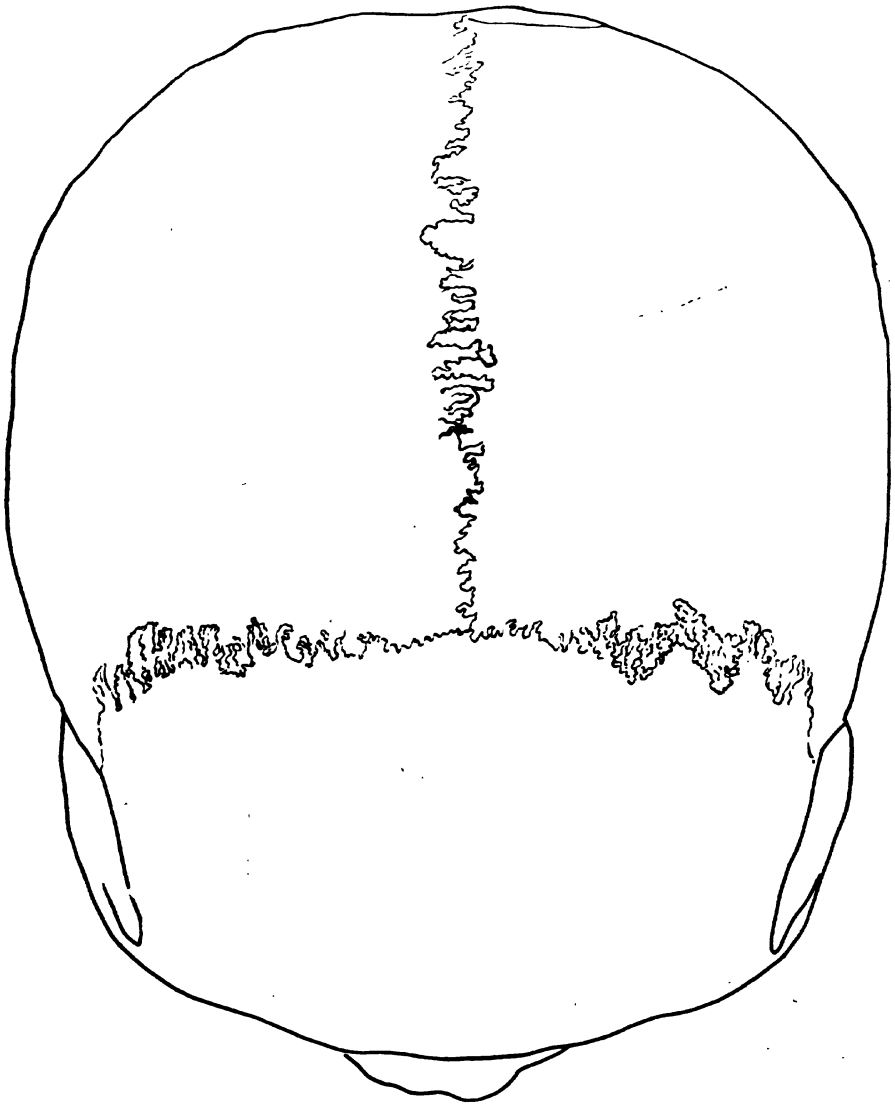

Fig 1. *Norma Verticalis*

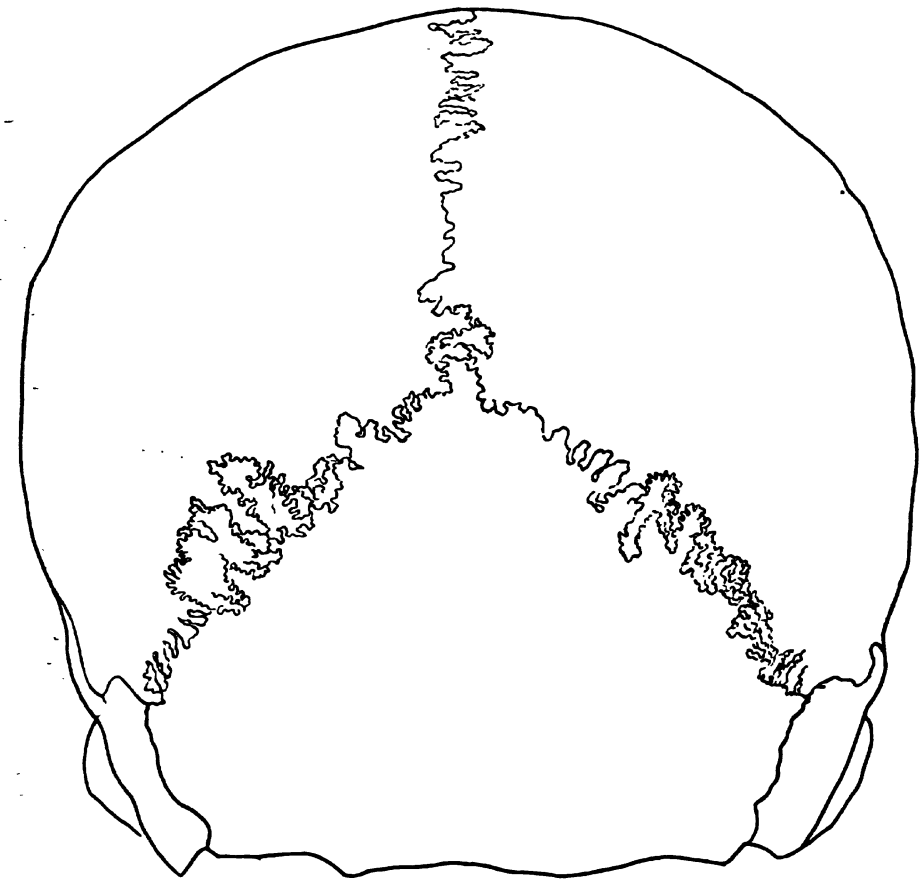

Fig. 2. *Norma Occipitalis*

DIOPTOGRAPH DRAWING : ONGE MALE (L.9)

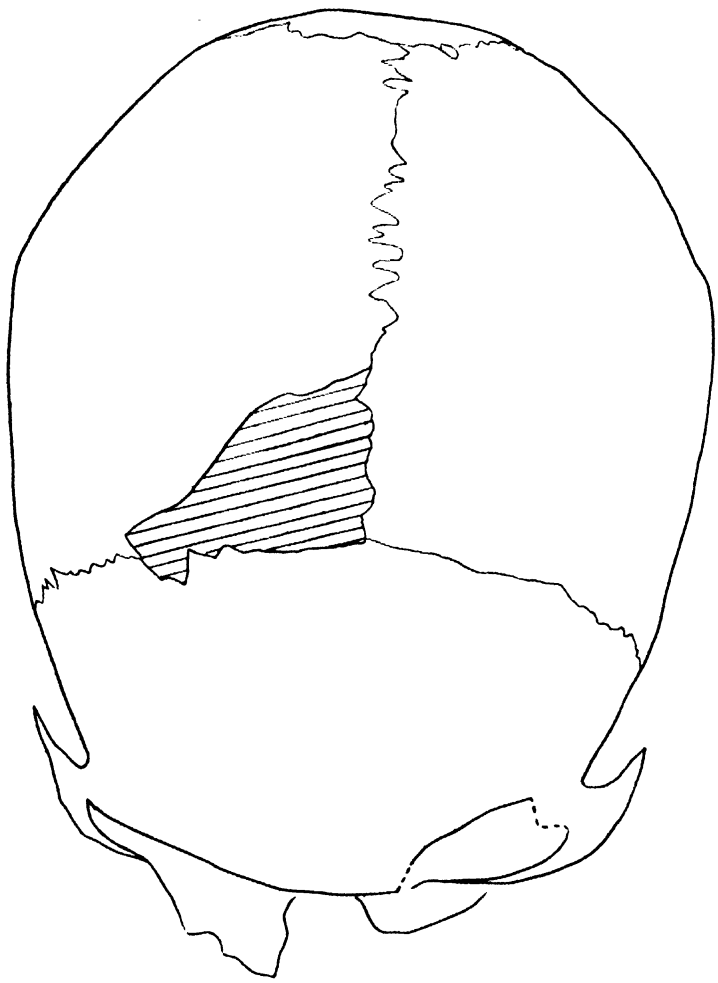

**Fig. 1.** *Norma Verticalis*

DIOPTOGRAPH DRAWING : ONGE FEMALE (L.6)

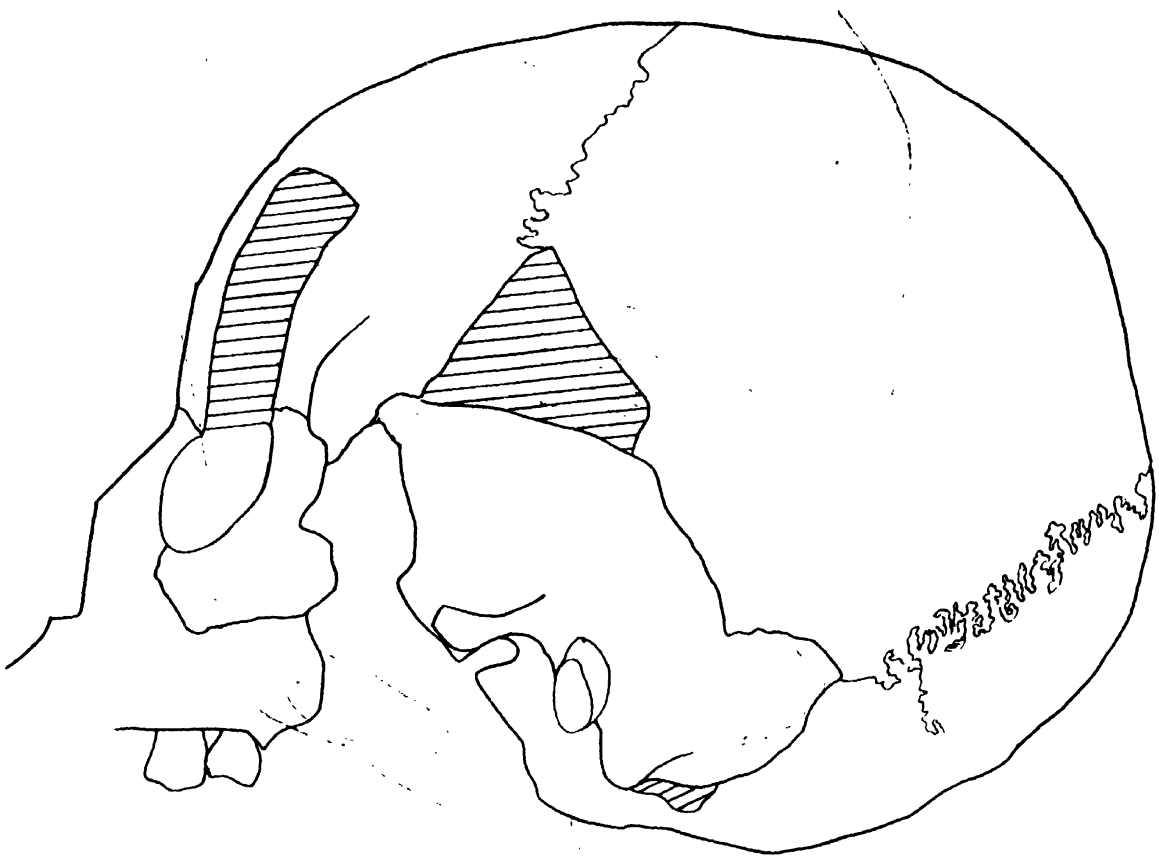

**Fig. 2.** *Norma Lateralis*

DIOPTOGRAPH DRAWING : ONGE FEMALE (L.6)

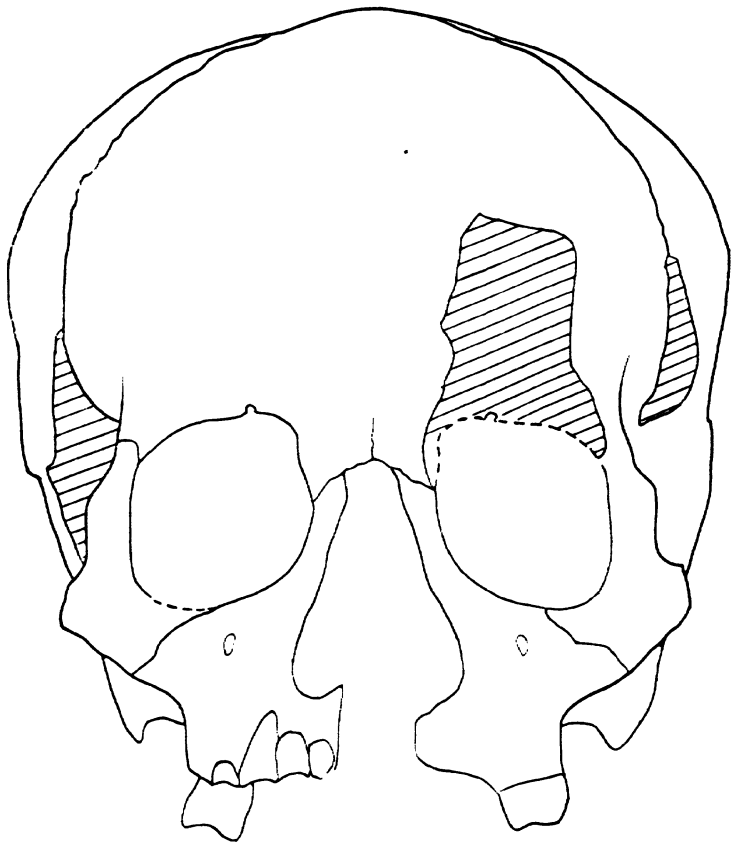

**Fig. 1.** *Norma Frontalis*

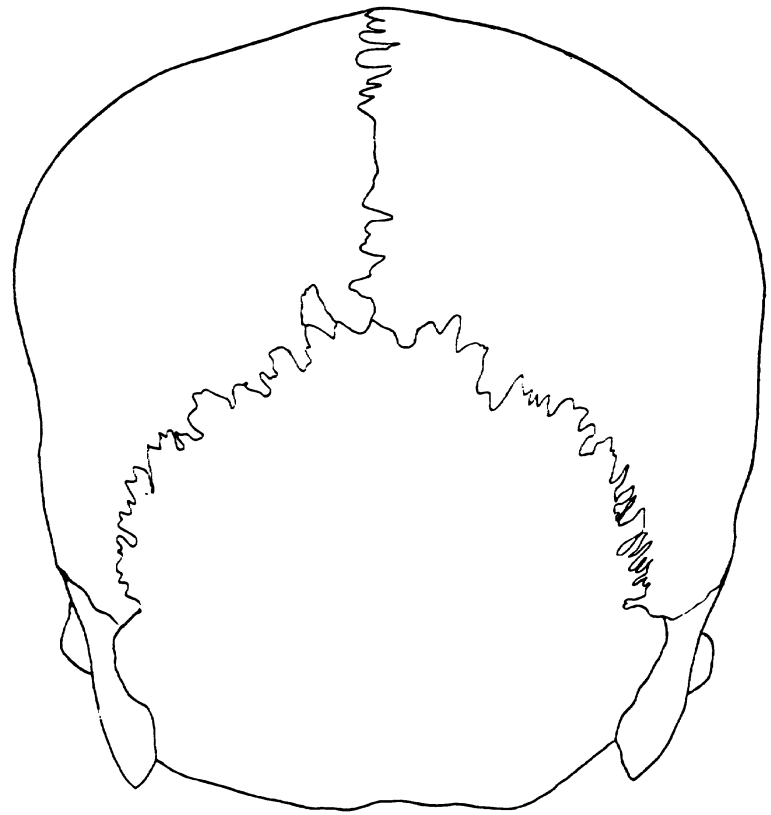

**Fig. 2.** *Norma Occipitalis*

DIOPTOGRAPH DRAWINGS : ONGE FEMALE (L.6)

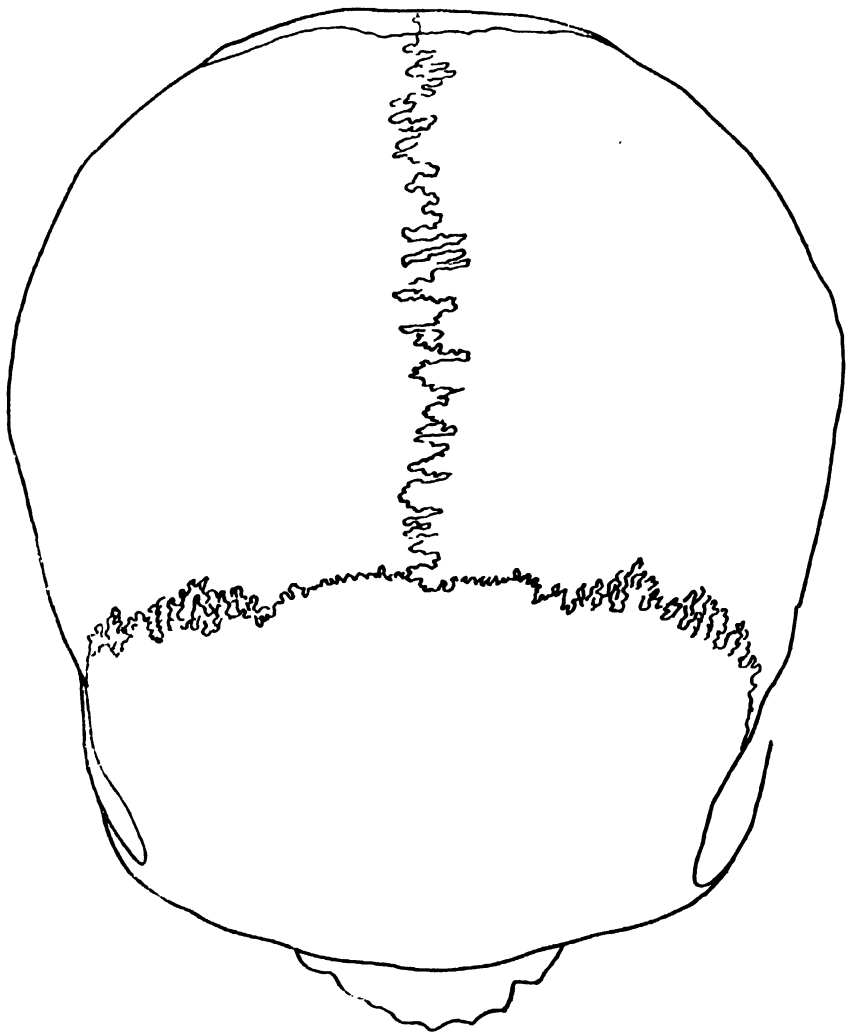

**Fig. 1.** *Norma Verticalis*

DIOPTOGRAPH DRAWING : ONGE FEMALE (L.8)

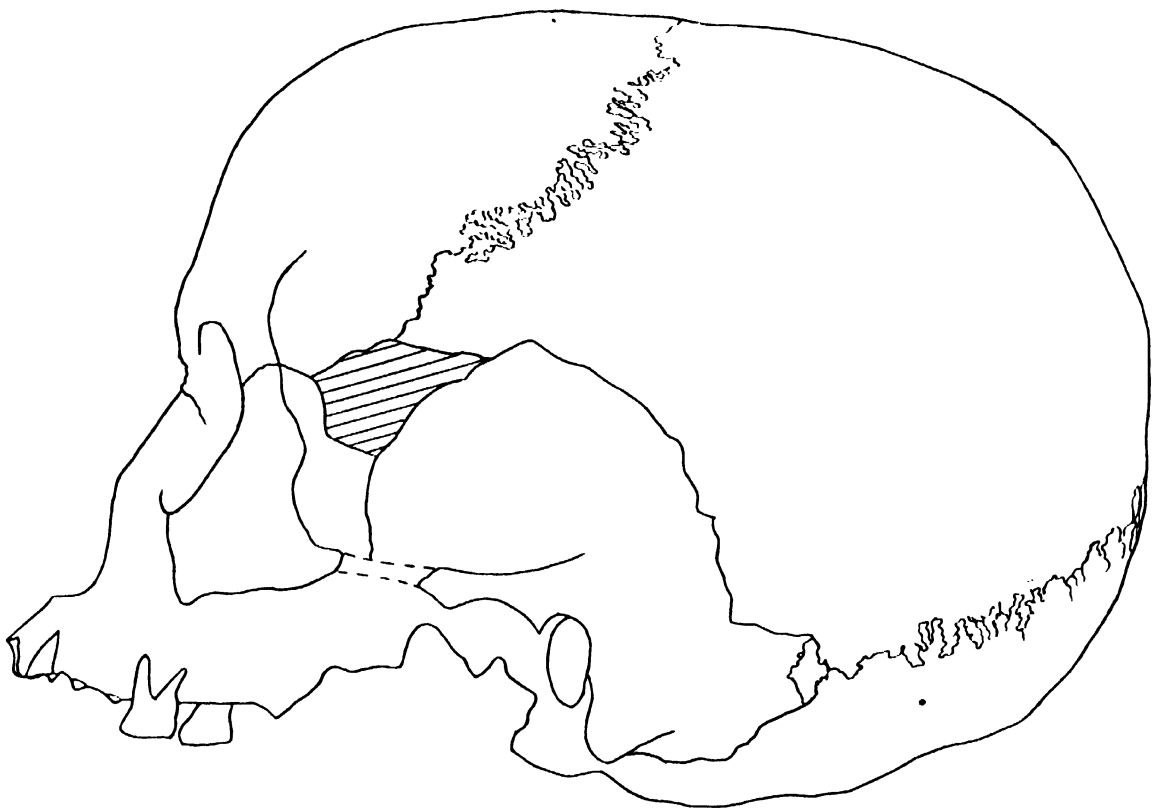

**Fig. 2.** *Norma Lateralis*

DIOPTOGRAPH DRAWING : ONGE FEMALE (L.8)

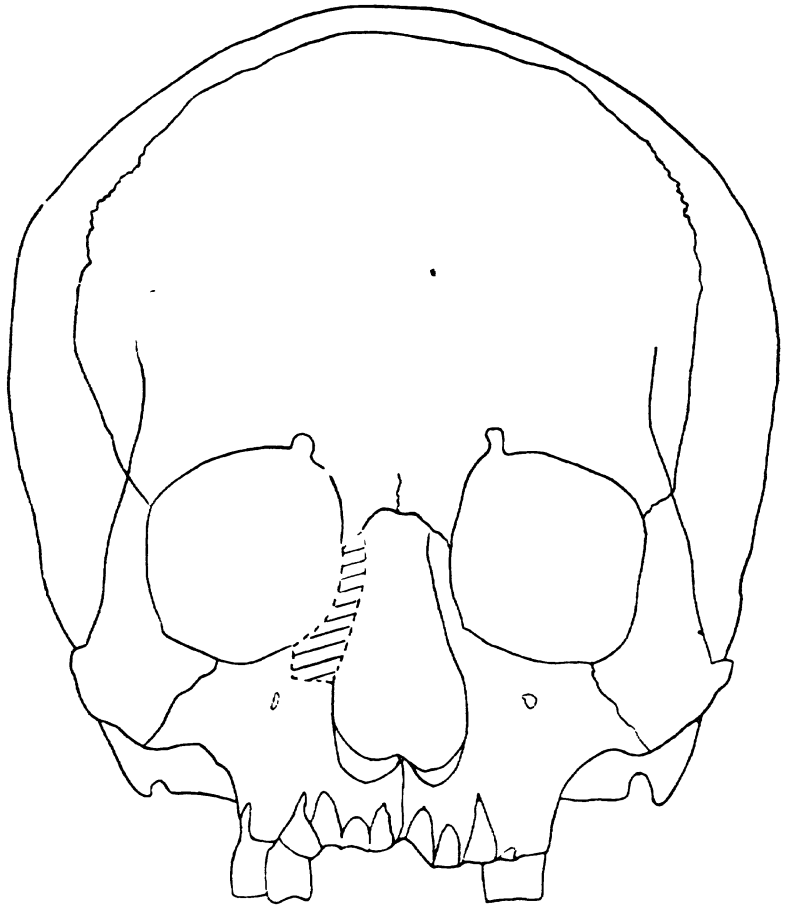

Fig. 1. *Norma Frontalis*

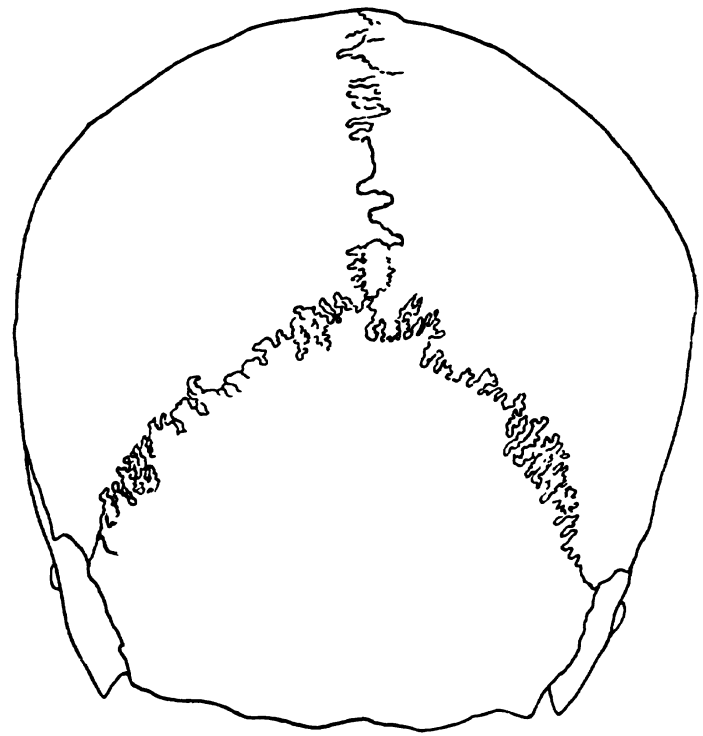

Fig. 2. *Norma Occipitalis*

DIOPTOGRAPH DRAWINGS : ONGE FEMALE (L.8)

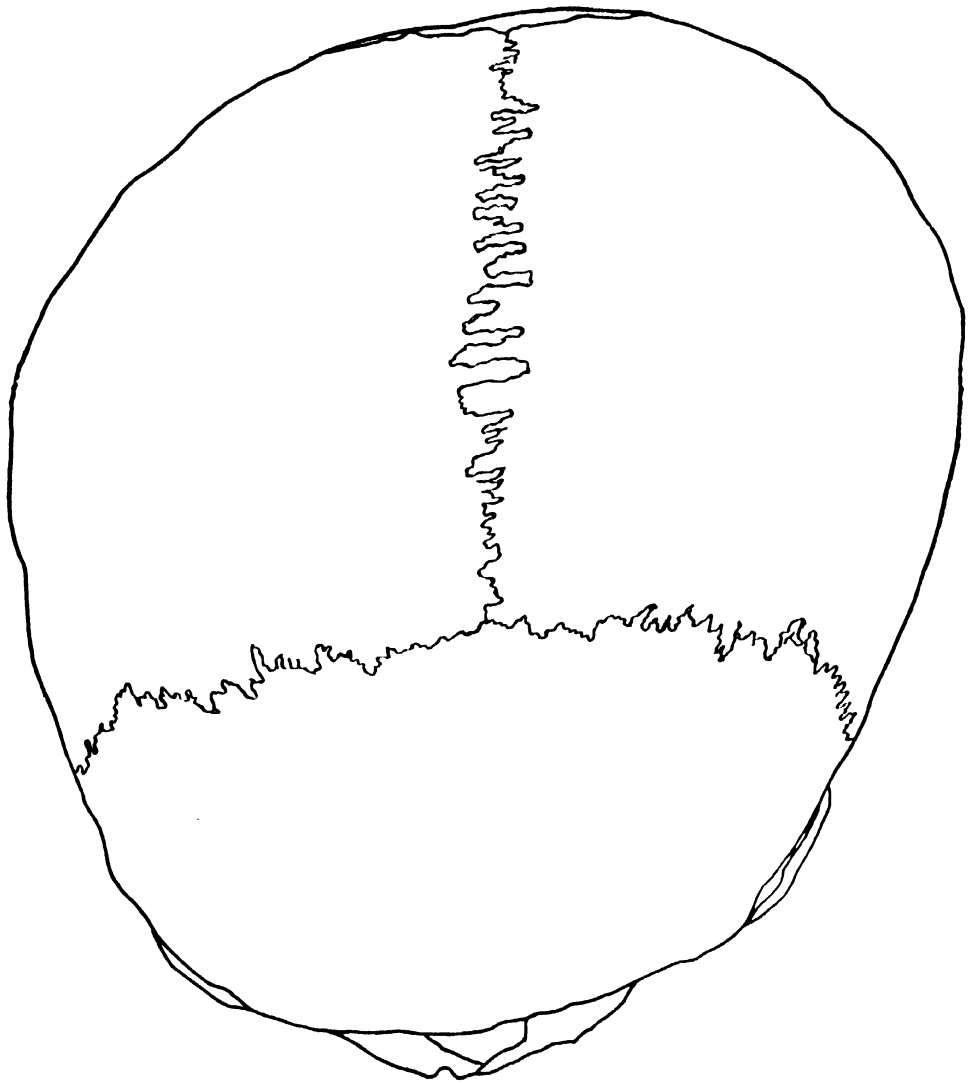

**Fig. 1.** *Norma Verticalis*

DIOPTOGRAPH DRAWING : ONGE CHILD (L.7)

**Fig. 2.** *Norma Lateralis*

DIOPTOGRAPH DRAWING : ONGE CHILD (L.7)

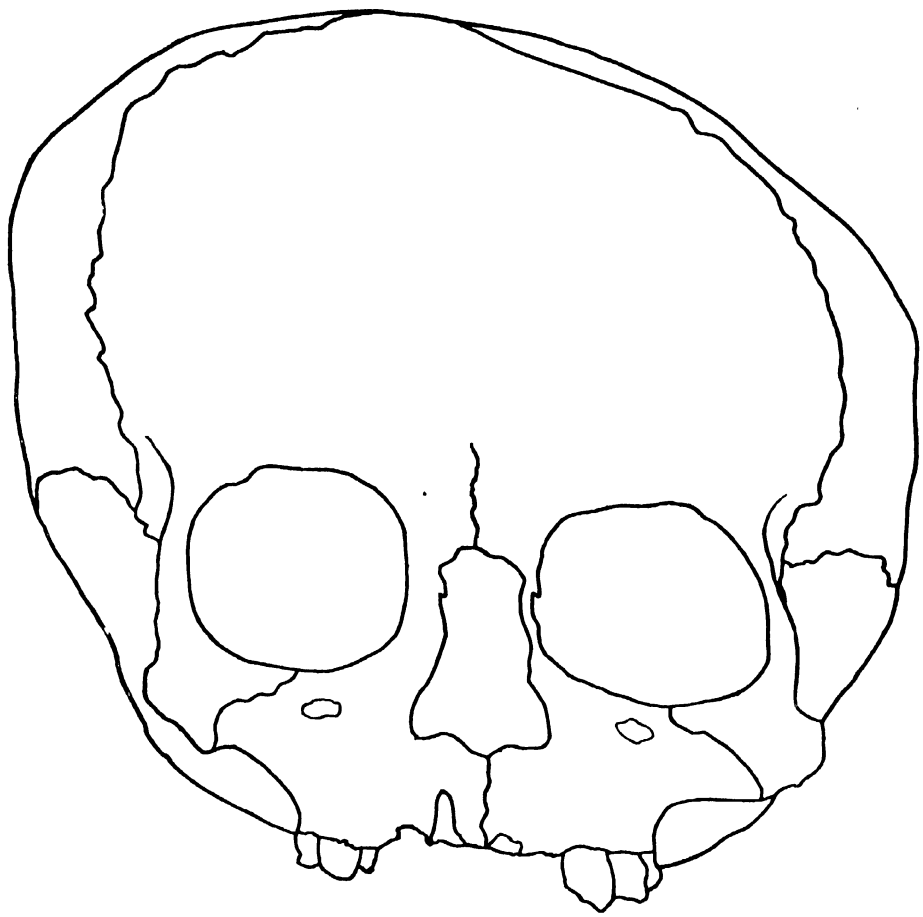

**Fig. 1.** *Norma Frontalis*

DIOPTOGRAPH DRAWING : ONGE CHILD (L.7)

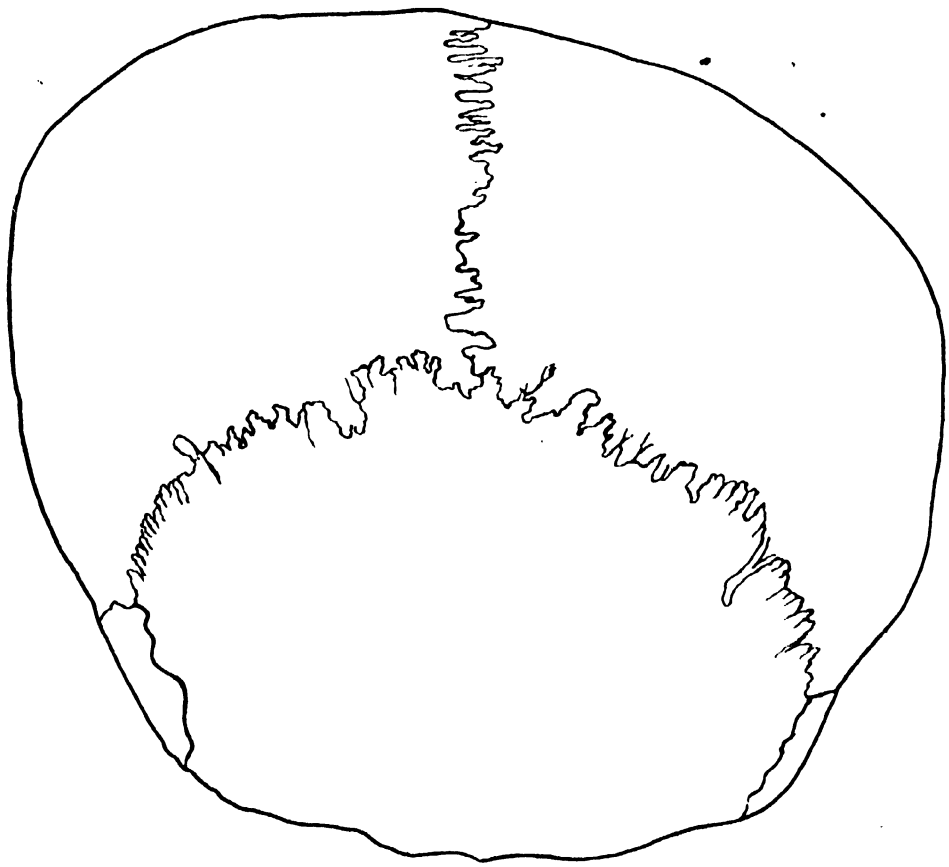

**Fig. 2.** *Norma Occipitalis*

DIOPTOGRAPH DRAWING : ONGE CHILD (L.7)

# INDIAN COUNCIL OF AGRICULTURAL RESEARCH

## Utilisation of the services of retired scientists in the field of agriculture, animal husbandry and allied sciences.

The existing rules regarding superannuation sometimes put an abrupt end of the research work of an active scientist or at any rate make continuation of such work extremely difficult as a result of which the talent of a good number of scientists who are physically fit and mentally alert is wasted after retirement for lack of opportunities to pursue work in their fields of specialisation. In order that the experience and talent of such scientists as have finished with their active professional career is not wasted, the Indian Council of Agricultural Research has decided to initiate, with effect from the 1st April, 1960, a scheme for the utilisation of the services of retired scientists in the field of agriculculture, animal husbandry and allied sciences.

2. Under the scheme retired/retiring scientists of established reputation who are still active in research will be enabled to continue their researches with suitable financial assistance from the Indian Council of Agricultural Research. The retired or retiring scientists should try to secure sponsoring Institution (which may be one from which he has retired or a different one) which would provide him necessary facilities for continuing his work e.g. access to the laboratory and library, accommodation for work etc. Failing this, the scientist may apply to the Indian Council of Agricultural Research and the Council will try to place him in a suitable Institution. The choice of the Institution to which the retired scientist would continue his researches will be left to the scientist himself but such Institution should be one acceptable to the Council. The retired or retiring scientist (within a year of his retirement) will submit to the Council, an outline scheme of research which he intends to undertake after retirement. In doing so he will clearly give an account of the research work done by him during the five years preceding the date of his retirement or application whichever is later.

3. An annual allowance not exceeding Rs 6,000/- will be provided to the retired scientist himself, if asked for by him, and a grant ordinarily not exceeding Rs 4,000/- to cover the cost of the research assistant and other expenses as may be decided by the Council. The amount of the grant may be increased in exceptional cases where the investigations involve field work neccessitating undertake of tours or where costly equipment apparatus have to be purchased.

4. The allowances and grants to the scientists under the scheme will be provided, in the first instance, for a period of three years only. As usual, annual progress reports shall be submitted to the Council by the scientist. Where the retired scientist would like the grant to be renewed, he will have to submit a year in advance of the termination of the first sanction, an application to that effect indicating the progress made under the scheme and the programme proposed to be followed during subsequent years. The allowances and grants to the retired scientists will be payable on a quarterly basis through the Institution to which the retired scientist is attached.

All applications for grant under the scheme should be submitted to the Council in the prescribed proforma which can be obtained, free of cost, from the **Secretary, Indian Council of Agricultural Research, Krishi Bhavan, Dr Rajendra Prasad Road, New Delhi.**